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EDITORIAL.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

The Old Year and the New.—The year 1931 has been a very severe one for farmers all over the world, and the adverse economic conditions, combined with local causes, such as foot and mouth disease, have made the farmer's lot in this country a most difficult one. The reduced purchasing power of the people of the Colony has affected the agricultural position to some extent, but only to a very small degree compared with the bad conditions prevailing in overseas markets. The world-wide depression re-acted most seriously on Mashonaland up to the end of March, and the feeling in Matabeleland was not so acute until foot and mouth disease broke out on the Nuanetsi Ranch early in April. This was immediately reported to the adjoining administrations and the movement of all cattle from the infected areas and areas adjacent to them was stopped. Unfortunately it was not cattle alone which suffered under the necessary quarantine restrictions, but the movement of all produce and material

which could possibly carry infection was also prohibited. For some months all trade was at a standstill, and the restrictions on a number of articles still remain.

To 1932 we look forward with hope and confidence. The general world position is not likely to right itself entirely within the space of one year, but there are unmistakable signs that the tide has turned and that the processes of re-adjustment have begun. The position in this Colony has so far improved that we can confidently anticipate the complete disappearance of foot and mouth disease in the near future, and we can hope for a return to more normal conditions before the end of the year. We have numerous illustrations of the wonderful recuperative powers of Southern Rhodesia, and have no doubt whatever that they have not been lost, but are only awaiting a chance to exert themselves.

We take the opportunity of wishing all our readers a happy and prosperous New Year.

New Rainfall Map.—In this issue is a copy of the new *Rainfall Map* prepared by Mr. N. P. Sellick, the Meteorologist of this Department.

A short explanatory article has been supplied, and, because of the importance of rainfall to the agricultural industry, it is expected that this will be of general interest.

It will be noted that the map is compiled from over 250 stations and reflects the rainfall position of the Colony more accurately than any previous map has done.

As new records become available over a period of not less than ten years, the map will be revised from time to time, but it is not anticipated that this is likely to occur more often than probably once in five or six years.

Wheat Growers' Association.—At a meeting of the Umvuma Farmers' Association held on Friday, the 11th December, 1931, it was unanimously agreed to form a Wheat Growers' Association.

The chair was taken by Lieut.-Col. Guest, and a number of visitors were present, including the Director of Agriculture and the Assistant Secretary to the Rhodesia Agricultural Union.

A very strong local committee was appointed to make the preliminary arrangements for circularising all wheat growers in the Colony in an endeavour to obtain a huudred per cent. representation in the association.

From the discussion which took place, and from the views expressed by representatives from a number of the adjacent wheat-growing areas, it would appear that there is every likelihood of the ambitious programme arranged for the new association being realised.

Moulds as Ferments.—Citric acid is now manufactured in large quantities from cane sugar. A sugar solution is infected with a particular kind of fungus in the same way as yeast is employed as a ferment, but the result in this case is the production of citric acid. It is estimated that about three million dollars' worth of citric acid is produced each year in the United States of America by this process, at about two-thirds the European market price of ordiuary citric acid.

A similar process has been developed whereby gluconic acid is produced from glucose by the action of a mould. This has made it possible to produce calcium gluconate at one four-hundredth part of its former cost. Calcium gluconate is the only tasteless salt of calcium known, and has a wonderful advantage over all others owing to the fact that it can be injected into the skin or muscles without causing necrosis of the tissues. This calcium salt also shows promise for the administration of calcium to poultry and cattle.

"Carton Beef": A New Empire Trade?—Experiments on the "quick-freezing" of meat, which may lead to the development of an Empire trade in "carton beef," were described at the Centenary Meeting of the British Association by Dr. T.

Moran, the meat expert at the British Government's Low Temperature Research Station at Cambridge.

Scientists have worked out processes for the quick-freezing of meat which have been so successful that the freezing of small joints of beef in cartons is now a commercial proposition. The joints are wrapped in cellophane and frozen in their cartons, and would go straight from the freezing works overseas to the British housewife without being touched by human hand. They would be retailed, like butter, in sealed packets. Joints which take 80 or 90 minutes to freeze in air can be frozen through in 30 minutes by the new method, in which a brine spray is used. But only joints less than four or five inches thick can be so treated.

"There are still many difficulties to be overcome," Dr. Moran said, "before a trade in 'carton beef' can be developed. But these are commercial and not scientific." The costs are high because inferior joints and offals cannot be exported. Retailers are not yet equipped with refrigerators, and temperatures in cold stores and on railways are not normally low enough for "carton beef," which needs lower temperatures than ordinary refrigerated produce. No one knows, either, what the British housewife will think of the new way of buying her joint. But the possibilities are so great that an effort to tackle the difficulties would be well worth making. The Empire Marketing Board has a small committee which is looking into the position.

Colouring Fruits by the Ethylene Method.—Some twenty years ago it was a common practice to hasten the colouring of fruits by shutting them up in a close room heated by an oil lamp. It was at first thought that the rapid colouring was due to the increased temperature, but it was found that the same effect was obtained from subjecting the fruit to the exhaust fumes of a motor car. About ten years ago it was demonstrated that the real cause of the effect was a chemical compound produced in both cases and known as ethylene. The practical application of this discovery was not possible on any large scale until chemical firms were in a position to supply ethylene gas in large quantities. This

is now available compressed in steel cylinders supplied with a gauge, which makes it an easy matter to liberate a measured amount of gas into an air-tight room, and during the last few years the treatment has been employed for colouring numerous kinds of fruits and vegetables. The great advantage of this process lies in the fact that fruit and vegetables can be picked at such a stage of maturity that they can be shipped with little danger of injury and then prepared for market at a rate approximating more nearly the rate of consumption. Under our conditions, moreover, it has been found that citrus fruits do not colour in keeping with the rate of actual ripening, and therefore lack attractiveness owing to poor colour. To remedy this the Mazoe Citrus Estates have been experimenting with the ethylene colouring process with very satisfactory results. In this case, where the fruit is actually ripe, but lacking in colour owing to climatic conditions, there could be no objection to the colouring process being applied, but the same cannot be said in regard to artificially colouring full-grown but not ripened fruit or vegetables. Investigations were recently carried out by the U.S. Bureau of Chemistry to ascertain what effects, if any, the ethylene process had on the composition of tomatoes coloured in this manner. It was found that the ethylene treatment did not change the vitamin content in any stage, but that tomatoes picked when full grown but still green, if coloured by this process, did not contain nearly so large an amount of vitamins as tomatoes allowed to ripen fully under ordinary conditions.

Tung Oil: a Crop worth trying in Southern Rhodesia.—Tung oil, expressed from the seeds of *Aleurites fordii*, Hemsl., was first introduced into the western world about thirty years ago from China, under the name of Chinese wood oil.

At the present time China exports practically the whole world's supply, amounting to about 70,000 tons, valued at three and a half million pounds. Since no other appreciable supply is known, there exists keen competition for the product, and relatively high prices are maintained, notwithstanding the fact that the quality is often poor.

Tung oil possesses such unique "drying" qualities that it is indispensable in the manufacture of waterproof and non-cracking varnishes, and it is widely used as an ingredient of certain paint media and insulating coatings.

Several species of *Aleurites* are known, *fordii*, *montana*, *moluccana*, *cordata*, and *trisperma*, but the best quality Tung oil is only obtained from *fordii*. These trees belong to the family *Euphorbiaceæ*, characterised by a milky juice, and *Aleurites fordii* is a smooth-stemmed tree reaching 30 to 40 feet in height. The leaves are ovate, three to five inches long, and the flowers are large, two inches or so in diameter, white or reddish white in colour. The fruit is top-shaped, two or three inches in diameter, usually containing five large seeds. The seeds contain a strong purgative and poisonous substance and must not be eaten.

Seeds were introduced into America from China in 1905, and during recent years the Empire Marketing Board has been taking an active part in distributing seeds, with the assistance of Kew, to various parts of the Empire. A large number of trees have been planted in the Union of South Africa, and it is possible that fresh seeds could be obtained from that source in the near future. In this country a few trees have now reached bearing age, and, under certain conditions, appear to do extremely well. It is suggested that this crop is worthy of greater attention, and should be tested out on a small scale at a number of different centres under varying conditions.

The Division of Forestry of this Department has taken considerable interest in the introduction of the Tung oil tree in this country, and has on several occasions distributed seeds free of cost, and a further supply has been ordered. It is anticipated that this will be on sale by about April or May next.

At the present time the Forest Nursery, Salisbury, has some 200 young trees available at 9*d*. each.

Round Table Conference.—At the last Rhodesia Agricultural Union Congress it was suggested that a round table conference should be called including the different live stock

industry interests, to discuss the restrictions due to the presence in the Colony of foot and mouth disease. This was held in the Department of Agriculture on the 17th November, and the chair was taken by the Honourable the Minister. Over twenty delegates attended, and the conference was fully representative of both the Matabeleland and the Mashonaland interests.

After the Minister had welcomed the delegates, and indicated the reason for calling the conference, the agenda, which had been prepared by the Rhodesia Agricultural Union, was considered.

Mr. H. G. M. Huntley explained that it had been decided at a private meeting that day to consider the general questions relating to export at a separate meeting, and suggested that foot and mouth restrictions should first be discussed with the Department, and then the cattle owners present should adjourn to discuss certain matters relating to export and to the cattle industry generally. This was agreed to.

Numerous questions were asked in regard to the restrictions which had been imposed, and the question of the desirability of dividing the country into definite zones, which in time of an epidemic could be considered as units for the purposes of restrictions, was discussed.

The Chief Veterinary Surgeon, Mr. J. M. Sinclair, replied to the questions raised, and the Director of Veterinary Research, Mr. Ll. E. W. Bevan, outlined the experiments he had carried out on foot and mouth disease, and indicated that he hoped that the experiments so far completed, and which established a speedy method of transmitting the disease to the entire herd as soon as cases occurred, would be helpful to the Veterinary Department.

The conference adjourned for lunch, and the meeting of cattle owners suggested by Mr. H. G. M. Huntley took place in the afternoon, after which the conference resumed at 4.30 p.m.

Colonel Robins reported that it had been agreed unanimously to form a Cattle Owners' Association representing the Colony as a whole. He stated that a circular letter had been sent out, and that the details of the constitution of this association were being drafted by a small committee.

Numerous points concerning the export of cattle and the possibility of exporting frozen or chilled meat in the future were discussed, and it is confidently anticipated that a number of misunderstandings have in this way been eliminated.

It is felt that this is the first of a series of such conferences which will be of the utmost importance and assistance in establishing a better understanding, and will lead to solutions being found for most of the problems which are at present making the cattle position in the Colony difficult.

Weeds.—All over the world farmers are faced with the most difficult time they have ever encountered, and it is not easy to discover remedies to restore the agricultural industry to a really healthy state again. One thing is certain: New standards will have to be adopted and everything which entails unproductive expenditure discarded.

It would be difficult to imagine a more fruitful cause of unproductive expenditure on a farm than weeds. They rob the soil of plant food and moisture, increase the labour costs, encourage pests of all kinds and crowd out the more useful plant growth.

Weeds are so easily recognised that it seems unnecessary to define the word, but the following definitions may be of interest:—

> All undesirable plants, wherever they may be growing, are weeds.
>
> Any plant that persistently grows where it is not wanted is a weed.
>
> Any injurious, troublesome or unsightly plant that is useless or comparatively useless is a weed.
>
> Any plant whose seeds can retain their vitality when buried in the ground, to appear again when not wanted, is a weed.
>
> Weeds that require more than ordinary care and methods to keep them in check are noxious weeds.

Weeds are often classified according to the period required for them to reach maturity. Thus *annuals* are plants which complete their whole life cycle from seed to seed in

one season. *Biennials* are plants which grow for two years. During the first season most of the energy is devoted to establishing the plant and to root development. The second season flowering stems are produced, and flowers and seeds are formed. *Perennials* are plants which continue to grow for several or many years from the same root system. If allowed to do so, they produce seeds each year just as annuals do. A number of weeds act as *winter annuals* if the seeds germinate in late summer—that is, the young plants remain small during the winter and then complete their growth and produce seeds early in the next summer.

It would appear that a number of well-known weeds, particularly several of the introduced varieties, are increasing and extending their territory rapidly, and that the old saying, "One year's seeding, seven years' weeding," will undoubtedly apply to most of our good soil areas unless steps are taken right away to avoid it. Two Canadian proverbs, "A weed pulled in time means a clean farm" and "Treat your weeds as you would have your neighbour treat his—only do yours first," are deserving of attention. It is of the utmost importance that no weed should be allowed to ripen seeds. Some weeds produce hundreds or even thousands of seeds from a single plant in one season, and the labour required to rid a farm may be increased a hundred-fold in a very few years.

The Noxious Weed Act of 1926 has not been strictly enforced, but it may be necessary to do so unless farmers are sufficiently interested in their own welfare to make this unnecessary.

Buy Rhodesian.—During 1930 some three-quarters of a million pounds worth of live stock and live-stock products, maize and other agricultural products were exported. Under present circumstances the export of practically all farm produce is either restricted or prohibited on account of foot and mouth disease, and there exists a very real and urgent need for the people of Southern Rhodesia to support their own products and industries. Only in this way can the adverse trade balance be relieved.

From six to ten per cent. of the European population of the Colony are farmers or primary producers, and it should be

an easy matter with such a small population to produce the Colony's requirements of such articles as the following, for which the import values for the years 1929 and 1930 are added:—

	1929.	1930.
Wheat	£80,538	£67,382
Flour and meal	28,620	28,927
Potatoes	23,873	12,268
Rice	10,384	9,715
Peas, beans and lentils	6,165	7,177
Barley, malt	8,150	6,884
Oats	2,413	1,844
Coffee (including ground and mixed)	23,672	16,845
Tea	67,653	44,423
Fruit and fruit products	95,657	75,854
Vegetables	12,705	10,121
Pickles, sauces and condiments	9,212	8,161
Plants, bulbs and trees	2,597	2,315
Vegetable, flower and field seeds	4,879	3,418

These figures indicate that actual markets exist in this Colony for agricultural produce greatly in excess of local production at present, and similar figures could be prepared for live-stock produce such as bacon and hams, imported to the extent of nearly twenty-one thousand pounds in 1930. To satisfy these requirements from local sources would demand on the part of the producers:—

That the quality must be up to the average trade standard. *Patriotic grounds will not force the* consumers of the Colony to purchase inferior products.

That the supplies must be fresh and regular.

That improved co-operative marketing methods must be adopted to ascertain where demands occur and to regulate the supplies to the needs of the various markets.

Under such conditions there would be no excuse for consumers not purchasing the Colony's own products, and we are certain 95 per cent. of the consumers would, in this case, be anxious to use local products.

We would urge the producers, therefore, to give greater attention to the requirements of our own markets and to produce the quantity and quality required. To the consumers we would appeal for greater discrimination in ascertaining the origin of produce offered for sale, and suggest that a little more trouble should be taken to ascertain where regular supplies of local produce can be obtained. In fact, wherever possible, we should buy Rhodesian.

Presentation to Mr. W. E. Meade.—Mr. W. E. Meade, reference to whose retirement from the office of editor of the *Rhodesia Agricultural Journal* was made in our last issue, was the recipient of a farewell presentation from the members of the Department of Agriculture on the morning of the 9th December.

In making the presentation, the Honourable the Minister of Agriculture and Lands referred to Mr. Meade's twenty years' service in the responsible post of editor and to the high standard which the Journal had maintained throughout the period of his editorship. The presentation, which took the form of a suitably inscribed silver cigarette box and a suit case, was eloquent testimony to the affectionate regard in which he was held by his colleagues, and on behalf of the entire staff he wished Mr. and Mrs. Meade every happiness and good luck in the future.

Mr. Meade in returning thanks conveyed his appreciation in particular to the professional officers of the Department for their unfailing support in the form of articles and other contributions. He confessed to having been dubious, when the question was first mooted, of whether so relatively small a staff would be able to provide sufficient material for a Journal published monthly, but events proved his fears to be groundless, and he believed that the monthly issue had maintained just as high a standard as had been attained by the previous bi-monthly issues. It was a great satisfaction to him that, apart from the salary of the editor, the cost entailed in the publication of the Journal was fully covered by the receipts. He appreciated very deeply the kind feelings which had led to the presentation, and, on behalf of himself and Mrs. Meade, he thanked most heartily all those

THE NORMAL RAINFALL OF SOUTHERN RHODESIA.

By N. P. Sellick, M.C., B.Sc., Meteorologist.

The earliest records of rainfall in Southern Rhodesia which are available to-day are those taken by the Rev. Helm at Hope Fountain, near Bulawayo, in 1888. Broken series of records at one or two places are available for the early part of the 1890's, but continuous records may be said to start from 1898.

There are complete records for the year 1898-99 from seven stations well distributed over the country, and this number has increased steadily up to the present date; in 1929-30 complete records were available from 529 stations.

Investigation has shown that at least ten years' records are required to obtain a reasonably close average for any one station. It is customary to correct this average by comparison with a long period station in the neighbourhood; the corrected figure is then called the "Normal."

There are over 250 stations in Southern Rhodesia with complete records covering a period of ten years or more, and the normals of all these have been corrected to the end of 1929-30 and a normal map plotted and included in this copy of the Journal.

An inspection of the map shows that the amount of rain is closely related to the orographic features, the main factors being nearness to the coast and altitude. It also appears that the north is more favoured than the south. The wettest station on our list is Stapleford, the Government Forest Station in Umtali, at an altitude of 5,350 feet, with a normal of 70 inches; and the driest is the township of Beitbridge on the Limpopo, at an altitude of 1,500 feet, with a normal of 11½ inches. The effect of altitude and aspect is very well shown in the Melsetter area, where Brackenbury, at about

6,000 feet, has a normal of 56 inches, and New Year's Gift, only 12 miles away, but in the Sabi Valley, at 2,700 feet, has only 29 inches.

The map shows steps of 5 inches from 10 inches to 40 inches. The number of stations recording over 40 inches is small, and little object would be served by attempting to sub-divide this area.

Twenty-seven per cent. of the country is not at present occupied by persons able to take reliable rainfall measurements; the remainder is divided as follows:—

10 ins. to 15 ins. rain	2 per cent.
15 ins. to 20 ins. rain	3 per cent.
20 ins. to 25 ins. rain	14 per cent.
25 ins. to 30 ins. rain	27 per cent.
30 ins. to 35 ins. rain	21 per cent.
35 ins. to 40 ins. rain	4 per cent.
40 ins. and over	2 per cent.

It appears that approximately half the country enjoys a rainfall of between 25 and 35 inches, and about 20 per cent., mainly in Matabeleland, is under the 25 inch line.

The total annual rainfall conveys a false impression without some reference to the distribution throughout the year. The mean rainfall at Greenwich, for instance, is 23½ inches, and at Bulawayo 24 inches. At Greenwich, however, the monthly means vary from 2½ inches highest and 1½ inches lowest, whereas at Bulawayo the highest is January with nearly 6 inches, and the lowest August with 0.03 inch, averaging a shower once every three years. Further, the evaporation from a free water surface in England is somewhat less than the rainfall, whereas in Bulawayo it approaches 100 inches.

Apart from areas on the eastern border, where winter rains are usual, the whole of the effective rain falls in the period October to April, and in general the October and April rains are small enough to have little effect.

An examination of the monthly means of rainfall shows a steady rise month by month from October to January and a fall from January to April. The actual daily records at Salisbury and Bulawayo have been reduced to a mean over a period of 34 years, and in spite of considerable smoothing,

it appears that the curve is by no means regular. Disregarding minor fluctuations, Bulawayo shows several increases and decreases, and Salisbury has a very marked increase in rain in the last week of November, and a protracted dry period round about Christmas. These fluctuations are very large and apparently real. It appears, therefore, that in the north we have two rainy seasons, one commencing in November and continuing into December; the second commencing in December and ceasing towards the end of March.

SALES.

AGRICULTURAL EXPERIMENT STATION, SALISBURY.

Spineless Cactus Slabs (Blades), Algerian Variety: 20 slabs, 5s.; 50 slabs, 10s.; 100 slabs, 17s. 6d.

Stocks are limited, and delivery cannot be undertaken until January next.

Kudzu Vine Crowns: 10 crowns, 5s.; 20 crowns, 7s. 6d.; 50 crowns, 15s.; 100 crowns, 25s.

Delivery during January for dry land. Owing to pressure of other operations, it is not possible to deliver Kudzu crowns during December. The prices are for delivery free at purchaser's nearest station or siding in Southern Rhodesia. Cheques should be made payable to the Department of Agriculture, and preliminary enquiries and subsequent orders should be addressed to the Chief, Division of Plant Industry, Department of Agriculture, Salisbury.

POISONOUS OR SUSPECTED POISONOUS PLANTS OF SOUTHERN RHODESIA.

TULP POISONING OF CATTLE.

By Sydney M. Stent, Senior Botanist, and D. A. Lawrence, B.V.Sc., Veterinary Research Officer.

Investigation by the Botanist into a case of suspected vegetable poisoning of stock at Marandellas revealed the fact that one of the blue tulps, *Moræa zambesiaca*, Bak. (Govt. Herb., Salisbury, 5226), not hitherto tested for toxicity, occurred in fair quantities along the river bank where the herd had been grazing.

Three sackfuls were collected and sent in to the Veterinary Laboratory, Salisbury, where feeding tests which proved the plant to be highly toxic were carried out.

Description of the Plant.—*Moræa zambesiaca* is one of the blue tulps. The root stock is a corm or bulb up to one inch in diameter, but often smaller, with two or three clustered together forming small clumps. One rather firm, narrow, green leaf is produced from each corm, attaining a breadth of about half an inch and a length of about eighteen inches, often over-topping the flowers. Stem one foot to one and a half feet high, sheathed quite or almost to the base of the flowering head; basal sheaths shorter, closely overlapping and rounded at the tip, more or less straw coloured.

Flowers blue purple, iris like, two or three together, between rather long pointed sheaths (spathes) and developing successively so that there is seldom more than one flower at a time showing from each stem, about two inches

across, with six petals, rather firm and narrowed from the middle to the base into a claw, above the middle broadened into a thin delicate blade—the three outer spreading or more or less reflexed from the middle, the three inner narrower, more or less erect. Anthers, three, closely appressed to the back of the three erect, two-lobed, petal-like stigmas.

Distribution and Time of Flowering, etc.—This species is recorded from several localities in Tanganyika Territory and Portuguese East Africa, but the only records we have of it in Southern Rhodesia are from Salisbury and Marandellas.

The plants were in full flower towards the end of September. The deaths occurred early in the same month.

Moræa zambesiaca is a near relative of *Moræa polystachya*, one of the blue tulps of the Union of South Africa that has been proved to be very highly toxic to animals.

Conditions under which Poisoning occurs.—The fact that animals in feeding experiments are most reluctant to eat the plant indicates that under natural conditions tulp poisoning is only likely to occur when the veld grasses are dry and parched, the green tulp coming into evidence before the new grass shoots. With the other known poisonous species of tulp which occur in the Union of South Africa it has been found that animals reared on tulp veld rarely succumb to poisoning by it, whereas stock recently introduced to such veld are very liable to ingest the plant and die. The explanation appears to be that the native stock when young eat sufficient of the plant to cause symptoms, but recover and are then guided by natural instincts to leave it alone in the future. Hungry animals, whether of native or imported origin, do, however, eat tulp, *e.g.*, when outspanned after a long journey or when settling down to graze after a long trek, especially in an area where the tulp is the only succulent plant present.

Most commonly poisoning only occurs when animals are moved from a non-tulp area to a tulp area.

This species of tulp, and also certain species which occur

fore constitute a very real source of danger when included in veld hay, animals being even more likely to eat them in this form than to graze them in the veld.

Moræa zambesiaca has been proved to be highly toxic to cattle and sheep, and somewhat less so to rabbits, and it is probable that all animals are susceptible. Under natural conditions, however, tulp poisoning may be expected most frequently in cattle, then goats, then sheep, and rarely also in donkeys on account of the methods of grazing of these animals.

Symptoms.—As little as four to five ozs. of green tulp is sufficient to kill a small ox. The symptoms to a large extent depend on the amount of plant eaten, large amounts producing severe symptoms and rapid death within a few hours, and smaller amounts causing symptoms after twelve to twenty-four hours and death within a day or more.

Cattle are first noticed to be restless and breathing heavily, frequently lying down for a few minutes and then again rising and walking around in an uneasy manner. Small amounts of water are frequently drunk, but food is refused. Later, breathing becomes still more distressed, and slight or severe bloating, *i.e.*, upward distension of the left flank, is observed. At this stage the animal appears to be suffering great abdominal pain, frequently kicking at its belly and bringing its head round to the flank. Grinding of the teeth and salivation are also noticed, and diarrhœa commences and may later become blood-stained.

Weakness develops, and finally the animal cannot rise and lies in various unusual positions, blowing heavily and grunting continuously, the expression throughout being very anxious. Death rapidly supervenes, the animal dying while struggling.

When dried tulp is fed in hay the symptoms produced are similar, but colic and diarrhœa are not so marked, and bloating may be absent. Four ounces of dried tulp fed in hay to a two-year-old heifer caused symptoms in twenty-four hours and death within the next twenty-four hours.

The symptoms in sheep are similar, though less distinct, the main symptoms being colic and very distressed breathing.

Post-mortem Findings.—After death bloating progresses rapidly, and the abdomen is found markedly distended. The anus is soiled with moist fæces, and blood may even exude; a few hæmorrhages and severe inflammation of mucous membrane of the anus may be noted. On opening the carcase the blood appears somewhat darker than normal. Blood spots (hæmorrhages) may be encountered on the outer and inner surface of the heart and on the surface of the otherwise normal spleen, occasionally also in the diaphragm. The lungs may appear normal in colour, or rather dark, and on cutting into them a fair amount of froth exudes. The fore-stomachs are distended with gas, if the green plant has been eaten, and the small superficial veins are filled with blood; the contents are rather fluid and slightly gassy; the lining peels off readily even shortly after death, and the surface so exposed is found to be red, and may even show hæmorrhages. The fourth or true stomach is practically empty, and the mucous membrane is somewhat swollen and inflamed, sometimes even hæmorrhagic. The small intestines are more or less empty and inflamed, and show small or large hæmorrhagic spots. The trachea (wind pipe) is either slightly inflamed or else the fine blood vessels are congested.

Treatment and Prevention.—Unfortunately there is no known specific antidote for tulp poisoning, and treatment is carried out with the object of preventing further ingestion of the plant, preventing further absorption of the already ingested plant, counteracting the adverse symptoms and eliminating the poison, absorbed or unabsorbed, from the system. Bearing these points in mind, one realises that any treatment to be effective must be commenced as early as possible, even if symptoms have not yet appeared, but the animal is known to have eaten the plant.

Where possible, a rapidly acting purgative, such as arecoline sub-cutaneously, should be given. If this cannot be effected, it is advisable to give a large dose of Epsom salts, *e.g.*, 1 to 1½ lbs., or raw linseed oil, 1½ to 2 pints, plus 1 to 2 ozs. turpentine if bloating is severe. The beast should not be allowed water for 24 hours. Gruels and milk should be given, and if the animal appears very depressed also a cupful of brandy. Tannic acid (¼ oz.) or copper sulphate (¼ to ½ oz.) may be given in cold gruel or lime water.

Should the animal recover, it should receive succulent and nourishing food and special care for at least a week.

Prevention, as in all other diseases, is better than cure, and can only be effected by keeping the animals away from the areas in which the plant occurs, either by herding or fencing, or by eradicating the plant, either by manual removal or by ploughing, and by ensuring that when cutting hay no tulps are included.

Other Plants Tested.—Several deaths were reported amongst cattle at Shamva, and after it was found that these losses could not be attributed to disease or arsenic, plant poisoning was suspected and an investigation conducted by the Botanist. Two types of plant, *Crotalaria* and *Sphenostylis*, certain close relatives of which are known to be poisonous, and another plant, *Trichodesma*, which was fairly extensively grazed, were suspected, and quantities were submitted to the Veterinary Research Department for feeding tests. These tests failed to prove the plants toxic, but in view of the suspicion attached to them a description is considered advisable.

Trichodesma physalloides, A.D.C.—A low growing, densely leafy shrub with delicate white or blue bell-like flowers that soon turn brown when handled. It occurs plentifully in the spring, especially on burnt veld, the compact clumps with their smooth blue-green foliage and delicate white or blue flowers showing up conspicuously against the blackened ground.

It belongs to the Borage family, which also includes the well-known comfrey, heliotrope, hound's tongue, etc. The family is not considered very harmful as a whole, though certain members of it are said to contain toxic properties.

Sphenostylis marginata, E. Mey.—A low growing, sparsely leafy (in spring) shrubby plant, erect or twining, leaves trifoliate, leaflets oval, very pointed, about 1½ ins. long by ½ in. broad and very shiny. Flowers greenish-yellow, about the size and shape of an ordinary pea flower, usually collected towards the tip of the long flower stalks. Pods long, narrow and flat, spreading horizontally from the stem. This plant belongs to the legume family and occurred in fair quantities over the suspected area. In consideration of

the fact that the legume family contains such a number of well-known stock poisons this plant was regarded with suspicion.

Crotalaria Rogersii, Bak. F.—Low growing shrub with trifoliate leaves; leaflets smooth, ovate, rounded at the tip and narrowing to the base. Flowers yellow, veined with purple-brown, and of more or less the same shape as the pea flower, but rather smaller and with the keel curved and sharply pointed. Pods about 1 inch long and more or less cylindrical. This is one of the "rattle box" plants belonging to the legume family. Several *Crotalarias* have been proved to be highly toxic to stock.

Procedure to adopt in Cases of Suspected Plant Poisoning.—Before attributing losses amongst stock to plant poisoning steps should be taken to determine whether these are not the result of infectious diseases, *e.g.*, anthrax, or mineral or chemical poisoning, *e.g.*, arsenic. When one is reasonably certain that deaths are due to plant poisoning an effort should be made to find out the particular plant responsible, in order to be able to guard against future losses from the same cause. Wherever possible the Botanist will investigate the area for the occurrence in any quantity of possibly poisonous plants, and if such are found two or three sackfuls should be collected and submitted to the Veterinary Laboratory for feeding tests.

In cases of mortality from unknown cause the following steps should therefore be taken:—

1. The symptoms, if observed, and the findings on *post-mortem* examination, which should be carried out in all cases unless there is a suspicion of anthrax, should be recorded.

2. Smears prepared from the blood and from the spleen should be forwarded to the Director of Veterinary Research.

3. A small quantity of the contents of the fourth or true stomach, together with a small portion of its wall, should be submitted to the Chief Chemist for analysis for the presence of arsenic.

4. A larger quantity of the contents of the rumen, or paunch, should be sent to the Senior Botanist. If the results of the smear examination and chemical analysis are negative, such material will then be examined for the presence of any recognisable fragments of poisonous plants.

GWELO MUNICIPAL DEMONSTRATION STATION.

ANNUAL REPORT, 1930-31.

By D. E. McLoughlin, Assistant Agriculturist.

Work has been in progress on this station for eight years, and the valuable information which has accrued therefrom is a tribute to the Gwelo Municipal Council and all those associated with the inception and development of the undertaking.

The experiments are planned on practical lines and serve to demonstrate the behaviour in the Midlands area of the more important crops of the Colony when grown under what are believed to be suitable methods of arable farming.

The red soil station is 10 acres in extent and is divided into 20 half-acre plots. During last season, experiments were carried out on 8 half-acre plots and on 24 quarter-acre plots.

Early rains in November and continuous rain in December provided excellent germination. Seeding commenced on the 25th November, and by the 28th November the planting of all the maize and dolichos bean plots was completed. The season, however, was a very unfavourable one for crop production on account of a rainfall in January which was 3 ins. less than the normal, followed by an almost entire lack of rain in March and April.

The total yield of maize from 5¼ acres was 9,371 lbs. of grain, or 8.9 bags per acre. Ground nuts yielded an average of 17 bags per acre.

The following table gives the distribution of the rainfall for the season and the average for previous years:—

Gwelo Gaol Records.

Month.	Rainfall, 1930-31.	Total No. of rain days.	Greatest fall in one day.	Average for 30 years to 1929-30.
July	.05	1	.05	.02
August	—	—	—	.08
September ...	—	—	—	.17
October	—	—	—	.74
November ...	1.84	8	.84	3.66
December ...	8.07	23	1.71	6.00
January	2.07	10	1.09	5.98
February ...	7.02	8	2.60	5.33
March	.80	3	.70	3.34
April	1.67	6	1.13	.71
May	.23	2	.21	.32
June	—	—	—	.02
Total	21.70	61	2.60	26.37

Gwelo Experiment Station (Sand Veld).

Month.	Rainfall, 1930-31.	Total No. of rain days.	Greatest fall in one day.	Average for 30 years to 1929-30.
July	—	—	—	—
August	—	—	—	—
September ...	—	—	—	.14
October	—	—	—	.51
November ...	1.66	10	.40	3.16
December ...	11.14	19	2.15	7.71
January	1.27	7	.80	4.26
February ...	6.46	9	2.01	4.20
March	.55	3	.50	2.50
April	.80	4	.40	1.32
May	—	—	—	—
June	—	—	—	.03
Total	21.88	52	2.15	23.83

There is no rain gauge at the red soil station, which is about two miles distant from the gaol and the sand veld station.

Red Soil Area.—Two four-course rotations are demonstrated, the land in each during the four years growing two crops of maize, one of ground nuts and one of Sunn hemp (Series "A"), and two crops of maize, one of dolichos beans and one of oats (Series "B").

In Series "A" no animal manure is used, but a green manure crop is ploughed under every fourth year, and the following maize crop receives artificial fertiliser. In 1923-24 and 1924-25 the maize after velvet beans received 150 lbs. complete maize fertiliser per acre, since when the dressing has been amended to 200 lbs. of bone and superphosphate per acre.

Ground nuts receive 200 lbs. of superphosphate per acre; these have been substituted for Sudan grass since 1925-26, the latter crop having previously received the same fertiliser treatment.

In Series "B" seven tons of kraal manure are applied to the maize every fourth year, while the legume crop—dolichos beans—is reaped for grain or fodder and the residue only ploughed in. Thus in these two systems the relative values of kraal manure and green manuring are compared.

The results afford a striking proof of the efficacy of green mannring in Rhodesia, since the average yield of maize in both rotations is virtually the same in number of bags over a period of seven years.

The adjoining control plot, which grows maize continuously without receiving either animal or green manure, demonstrates the rapid fall in fertility which has taken place in the same period on land farmed in this manner.

RED SOIL STATION: ROTATION EXPERIMENTS.

SERIES "A."

Plots of ½ acre each.

Yields of Maize in Bags of 200 lbs. each per acre.

Yields of Ground Nuts in Bags of 75 lbs. each per acre.

Crop.	1930 31.	Average yie'd per acre, 7 years.
Velvet Beans } ploughed **Sunn Hemp* } under.	—	—
Maize.—Receives 200 lbs. per acre bone and superphosphate; after Sunn hemp ploughed under	9.81	13.7
Maize.—Receives no fertiliser; after maize receiving fertiliser	8.36	11.31
Ground Nuts.—Receive 200 lbs. per acre superphosphate; after maize receiving no fertiliser	17.5	(6 years) 18.0

* Commencing 1930-31, Sunn hemp replaced velvet beans as a green manure crop.

SERIES "B."

Yields of Velvet Beans and Dolichos Beans in Bags of 200 lbs. per acre.

Crop.	1920-31.	Average yield per acre. 7 years.
Velvet Beans } reaped.	—	3.14 (5 years)
**Dolichos Beans* } reaped.	4.42	4.42 (1 year)
Maize.—Receives 200 lbs. superphosphate per acre; after beans reaped	11.2	10.96
Maize.—Receives 7-8 tons farm manure per acre; after maize plus fertiliser	11.31	14.78
Oats (*Kherson*).—After maize plus farm manure	Failed	501 lbs. (3 years)

* Commencing 1930-31, dolichos beans replaced velvet beans.

MAIZE CONTINUOUS.

Crop.	1930-31.	Average.
"A"—*Maize continuous.*—Without treatment	5.2	6.56
"B"—*Maize continuous.*—Receives 150 lbs. per acre bone and superphosphate every third year (fertilised, 1930-31)	9.16	9.67

Note.—In 1927-28 fertiliser was applied to plot "A" by error instead of to plot "B," which should have received fertiliser every third year, and which in future will receive fertiliser every alternate year—commencing 1930-31.

The attention of those who question the wisdom of green manuring in areas of light and uncertain rainfall may be drawn to the fact that even in seasons when the precipitation failed to exceed 23.5 inches, namely, five years out of the seven, the maize yield in Series "A," where a leguminous green manure crop is ploughed under once in four years, and a normal dressing of 200 lbs. phosphatic fertiliser is applied twice in four years, has equalled the yield of the maize in Series "B," receiving 7 to 8 tons farm manure and a normal dressing of 200 lbs. phosphatic fertiliser. *Over the whole* period of seven years green manuring with a legume, combined with two dressings of phosphatic fertiliser, has proved fully as efficacious as a dressing of 7 to 8 tons farm manure and one dressing of phosphatic fertiliser.

The importance of a rotation of crops which will provide an adequate supply of humus in the soil, combined with dressings of phosphatic fertiliser once or twice in the four-year period, and maintain the fertility of the soil at a high level, is very well demonstrated by comparing the yields in both Series "A" and "B" with those of the maize grown continuously without any treatment, and the maize continuous with fertiliser every alternate year.

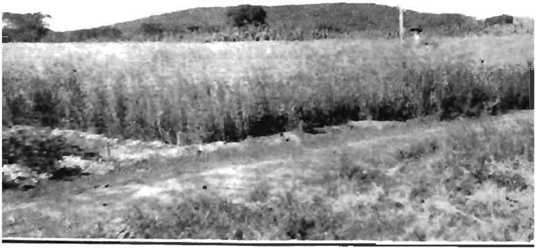
Manurial and Fertiliser Trials.—These experiments were *commenced in 1929-30 as the result of analyses of the soil of* the station made by the Chemical Division of this Department. Experiments of this kind cannot, however, be carried out here with the same wide range of fertilisers that would be possible on one of the Government stations, and in this case the tests were of necessity designed more as practical than as highly scientific experiments. The work serves to demonstrate the economic value of (a) kraal manure used alone; (b) kraal manure in conjunction with certain artificial fertilisers; and (c) the same artificial fertilisers used without kraal manure.

The manure which was available can best be described as being "loose manure," being that collected from the municipal stockyards, and was, therefore, lacking in the decayed litter associated with true farm manure. The superphosphate used was *standard 19½% P_2O_5,* the muriate of potash 60% K_2O, and the complete maize fertiliser con-

Red Soil Area, Gwelo Municipal Demonstration Station.
In the foreground, velvet beans following oats. In the background maize plus 200 lbs. bone and superphosphate per acre after velvet beans reaped. 1928-29.

Velvet beans to be ploughed under after ground nuts plus fertiliser, 1928-29.

Red Soil Area. 1928-29.
Maize plus 200 lbs. bone and superphosphate per acre after velvet beans ploughed under.



Sand Veld Area. 1928-29
Kherson oats in Rotation No. 1.

tained 12½% P_2O_5; 3% N; 2% K_2O. The lime was applied to the half of each quarter-acre plot at the rate of one ton per acre.

In order to render the results as comparable as possible, the land selected had previously received similar treatment and grown the same crops, namely, maize for four years without the application of any fertiliser, followed by dolichos and velvet beans for one year without fertiliser. Previous to the first maize crop it was virgin land, having been first broken up in 1923-24.

MAIZE MANURIAL TRIALS.

Plots of ¼ acre each, sub-divided into half; one half limed, the other no lime.

Yields of Maize in Bags of 200 lbs. each per acre.

Season 1929-30. Fertiliser treatment per acre.	1930-31. Plus 1 ton lime.	1930-31. No lime.	*Average of whole plot for 2 years.
6 tons kraal manure	13.68	12.88	9.73
6 tons kraal manure, plus 250 lbs. superphosphate	11.16	12.04	9.21
6 tons kraal manure, plus 250 lbs. superphosphate, plus 75 lbs. muriate of potash ...	10.64	9.00	8.69
250 lbs. complete maize fertiliser	11.68	10.56	8.93
250 lbs. complete maize fertiliser, plus 75 lbs. muriate of potash ...	9.68	8.72	7.90
250 lbs. superphosphate, plus 75 lbs. muriate of potash	12.04	9.88	10.03

* Unfortunately, in the season 1929-30 the limed and unlimed portions of each plot were not reaped and weighed separately and so for that year only the average yield for the whole of each plot is available. The average for each whole plot is again given for 1930-31 for comparison.

No useful deductions can be drawn from the experiment at the present time and a second three-year cycle must elapse before this can be attempted.

Fertiliser and Green Manure Trials.—This series was introduced to investigate under local conditions the effect of (a) applying phosphatic fertiliser direct to the green manure crop which will be followed by maize, and (b) of applying the same fertiliser dressing to the maize crop following the unfertilised green manure crop of the previous season. Here, raw rock phosphate is applied in both cases at the rate of 200 lbs. per acre.

Method (*a*).—As regards this method, it is claimed by some that in seasons of intermittent and lengthy drought, heavy dressings of fertiliser in the absence of an adequate supply of organic matter and moisture in the soil produce adverse effects on the young maize, causing, after a period of forced growth, a "burning" of the plant, from which it does not readily recover. If the same amount of fertiliser is applied to the previous green manure crop, it increases the bulk of vegetable matter to be ploughed under and the amount of humus thereby added to the soil, and this should aid the moisture-retaining capacity of the soil, affording the crop better opportunity to compete against adverse climatic conditions.

The main objection against this method is the expenditure of money on fertiliser for the green manure crop 20 to 24 months before the following cash crop will be harvested and sold. This money is locked up, and it is, therefore, obvious that the increased returns obtained by this system should be sufficient at least to cover the interest on the expenditure thus incurred.

Factors which must influence the question are the productive power of the land at the time the decision must be taken and the solubility of the phosphatic fertiliser used, particularly in the case of a reputedly slow acting one such as raw rock phosphate.

The following are the results for the first season (1930-31) of the experiment under a precipitation of 21.88 inches:—

Maize, untreated, after Sunn hemp, plus 200 lbs. raw rock phosphate per acre, ploughed under	8.56 bags per acre
Maize, plus 200 lbs. raw rock phosphate per acre, after Sunn hemp, untreated, ploughed under	5.26 bags per acre

Ground Nuts.—The highest yield of ground nuts obtained on this station was 23 bags per acre in 1925-26, in Rotation "A," with a rainfall of only 19.53 inches. The average yield to date is 17 bags per acre, and this affords good proof of the suitability of the crop to local conditions of soil and climate. The plant does equally well on sandy soils in good fertility as on the red loam, the best results being obtained when the crop is grown in a rotation with maize or tobacco, and which includes a green crop ploughed under about once in four years. The main problem at present with ground nuts is to obtain a good stand of plants in the field, and this difficulty, coupled with the indifferent attention which is accorded the crop on the average farm, accounts for the deplorably low average yield per acre over the Colony as a whole. To obtain economical returns, even more care perhaps needs to be exercised in planting than with maize. A close spacing of 6 to 8 inches between the plants in the row and as close a spacing between the rows as will permit of machine cultivation is necessary. The seed could also with advantage be passed through a farm-made sieve of the desired mesh to obtain a more uniform sized kernel for sowing. The "brush attachment" specially designed for planting ground nuts and supplied with some makes of planters has proved very satisfactory when correctly adjusted to secure just the required pressure to brush the seed through the holes in the plates. It is better to use a little extra seed than to have to plant an extra acreage to obtain the same yield.

The fact that the Virginia Bunch variety takes longer to mature is often overlooked, and this variety should be planted considerably earlier than Spanish Bunch.

Ground nuts are a valuable stock feed, and the grinding of the whole plant with the nuts attached into a meal is becoming a very general practice.

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Yields in Bags of 75 lbs. each, unshelled, per acre.

Treatment.	1930-31.	
Spanish Bunch, in Rotation "A"	17.5	Average yield of 12 plots in 7 years 17.0
Spanish Bunch, with 200 lbs. superphosphate, plus 6 tons kraal manure per acre	16.5	
Virginia Bunch, with 200 lbs. superphosphate, plus 6 tons kraal manure per acre	17.0	

Experience, both on this station and elsewhere, indicates that direct applications of manure and fertiliser to the nut crop are usually unprofitable, and that the most economic results are obtained when the crop is taken as part of a sound rotation system, by means of which the soil is maintained in a good all-round state of fertility.

Legumes for Hay.—The growing of annual summer legumes is of great importance to every farmer, since, apart from their value in providing a hay rich in protein for all classes of stock, they aid very materially in maintaining the soil in good fertility. The more spreading and trailing types serve a dual purpose in checking to some degree surface erosion of the soil. For hay, the heaviest yields are generally obtained from dolichos beans, velvet beans and cowpeas, and for green manuring purposes from the same crops, with, in addition, Sunn hemp.

The marked ability of all four crops to withstand drought renders them particularly valuable for areas of light rainfall. A comparison of Soya bean yields grown with and without the specific Soya bean bacteria is of interest. The treated crop gave a decided increase in yield of grain, and it is hoped that once the necessary bacteria are incorporated in the soils of the Colony, the crop will take first place as a legume hay, its upright growth being of great advantage for mowing.

Yields of Grain in lbs. per acre.

Crop.	1930-31.	Average yield to date.
Dolichos bean (brown, small-seeded)	884	734 (5 years)
Inoculated Soya bean (Otootan)	700	700 (1 year)
Not inoculated Soya bean	488	433 (2 years)
White stingless velvet bean	—	661 (5 years)
Tracey's early black velvet bean	—	800 (1 year)
Osceola velvet bean	—	660 (1 year)
Sunn hemp	434	411 (2 years)

Wheat and Oats.—In this test, summer wheat for poultry feed and oats were a complete failure owing to drought. Since satisfactory returns from these crops are obtained in parts of the country more favourable for their production, such results may be misleading to farmers in areas of lighter rainfall. These crops can only be relied upon to give satisfactory returns under a fairly liberal rainfall and when grown on fertile soil. Local experience indicates that they are intolerant of drought, and should therefore be grown with reserve until individual farm conditions have been proved suitable to their requirements.

The same remarks apply also to Boer manna. When intended to be grown for hay, both manna and oats are best included in a mixed sowing with Sudan grass. The latter crop, being very drought-resistant, affords an insurance against complete failure.

SAND VELD STATION.

Owing to the poor yields it has recently given, this station was cropped to Sunn hemp with raw rock phosphate during 1930-31. The hemp was ploughed under in March, 1931. The growth was so heavy and the ground so hard owing to lack of rain in February and March, that the greatest difficulty was experienced in getting the crop turned under. It will be of interest to note next year the yields which this poor sand soil will produce after so thorough a green manuring.

EPHESTIA ELUTELLA, HB., AS AFFECTING THE SOUTHERN RHODESIAN TOBACCO EXPORT TRADE.

By Rupert W. Jack, F.E.S., Chief Entomologist.

It is now known generally amongst those more immediately concerned that the Pyralid moth, *Ephestia elutella*, Hb., chiefly notorious in the past as a pest of other stored products, has developed into a serious pest of stored tobacco in Britain.

The moth attacks mainly bright and medium leaf, including both Virginia and Turkish, and is considerably more to be feared in Britain than such a pest as the tobacco beetle (*Lasioderma serricorne*, F.), as it has apparently demonstrated its ability to multiply under the climatic conditions obtaining there, whereas the increase of the tobacco beetle appears to be checked to a considerable extent by the low average temperature.

Tobacco manufacturers in Britain take a very serious view of infestation with this insect, and infested bales of tobacco are depreciated in value far beyond the value of the leaf actually destroyed or damaged. Consequently this pest is to be regarded as a menace of the first importance.

The distribution of *Ephestia elutella* is more or less cosmopolitan. It has been recognised as a very bad pest of cacao, cocoa and chocolate. In addition, it is known to attack dried fruit, coffee, walnuts, cotton cake, flour, ships' biscuits, ground nuts, etc. The first record of its attacking tobacco refers to Bulgaria in 1928. Subsequent records referred only to Great Britain, until 1930, when the insect was found to be doing great damage to bright Virginia leaf at Richmond, Virginia, U.S.A. This last discovery occasioned considerable uneasiness amongst tobacco interests in Virginia.

Ephestia elutella has been found in Salisbury, Southern Rhodesia, attacking both chocolate and tobacco. So far, it has not been found anywhere away from Salisbury. Under the "Tobacco Pests Suppression Act, 1931," cleansing measures have been enforced in the exporting warehouses, and, as far as is known, none of these is infested at the present time.

An inspection of the port of Beira by the writer in November, 1929, led to the conclusion that that port was not primarily to blame for infestation of exported tobacco with *Ephestia*. The tranship sheds and surroundings were found to be in a cleanly condition and it appeared that tobacco was not kept in the sheds for any length of time. No possible permanent breeding places could be found.

Cross infestation may, however, well occur at the port if infested consignments are forwarded from Nyasaland, Northern Rhodesia or Southern Rhodesia.* If it can be assured that tobacco and other produce consigned through the port are free from the pest, it is to be inferred that, after a certain period, presuming prolonged storage of tobacco or other produce susceptible to attack is avoided, the port itself will not constitute a menace.

It is probable that the chief danger in any case lies with *tobacco*, because moths resulting from larvæ which have fed on tobacco are probably more likely to lay eggs on tobacco than moths bred from larvæ which have fed on other products. This tendency is a potent factor in reference to the adoption by any insect of a new pabulum. Available evidence suggests that *Ephestia elutella* has only recently taken to feeding on tobacco, indicating that transition from its former foods to tobacco has not been readily effected. A strain of the insect adapted to feeding on tobacco has, however, now obviously been set up at various centres.

It may be added that *Ephestia elutella* has not yet been found feeding on ground nuts, ground nut cake or any produce other than imported chocolate and tobacco in Salisbury.

* To the best of the writer's knowledge *Ephestia elutella* has not been recorded in either Northern Rhodesia or Nyasaland.

In addition to the possibility of cross infestation in the tranship sheds at Beira, the mingling in ships of tobacco from various countries gives ample opportunity of cross infestation occurring *en route* to England.

In reference to this danger, other countries than those exporting through the port of Beira, for example the Union of South Africa, might be involved, either in originating or contracting infestation, but it seems doubtful whether the Union consigns an appreciable amount of tobacco by the east coast route at present.

Whilst it may not be practicable to ensure that tobacco in a clean condition leaving any of the countries involved will not be exposed to danger of infestation on the boat which carries it to England, it appears highly desirable in the first place to ensure as far as possible that it is not exposed to cross infestation at the port, and to endeavour to minimise the risk of cross infestation occurring *en route.*

In this connection it is felt that co-operation between Northern Rhodesia, Nyasaland and Southern Rhodesia would go far to remove the risk of cross infestation at Beira, and that if the Union should ship in the future any appreciable quantity of tobacco by the east coast route, her interests would be identical with those of tobacco exporting countries using the port of Beira. Other east coast ports are, of course, involved, but the amount of tobacco exported through ports other than Beira is at present understood to be very small.

Enforcement of the "Tobacco Pests Suppression Act, 1931," has gone far to ensure that no tobacco exported from Southern Rhodesia will be seriously infested with either *Ephestia elutella* or *Lasioderma,* although, of course, complete freedom from these pests cannot be guaranteed. It is thought that if Northern Rhodesia and Nyasaland would enact similar measures the risk of contamination at Beira or on the voyage to England would be reduced to the minimum, on the assumption that the Union would also take measures to ensure cleanliness of consignments if shipping by the east coast route.

Entomologists in the other countries concerned are likely to be interested in the question of how freedom from the moth is to be assured in the exporting warehouses.

This no doubt depends considerably on local and other conditions, but during the past season in Southern Rhodesia little difficulty has been experienced in ensuring at least approximate freedom. The measures adopted have consisted of enforcing simple cleanliness, that is, elimination of waste tobacco, etc., in which the insect may breed indefinitely. This measure appears likely to suffice in the case of store rooms on farms which contain tobacco during a comparatively short period of the year only. In actual fact, the moth has not yet been found under these conditions.

In central warehouses which may contain tobacco during the greater part of the year the same cleanliness has been enforced and considerable additional protection has probably been secured by the practice of wrapping the bales in tarred paper. "Proctoring" the tobacco is regarded as a fully effective cleansing process in regard to the moth. This is practised chiefly in the big central warehouses. The tobacco is baled and wrapped in tarred paper and hessian coverings immediately it leaves the "Proctor" machine.

Experiments to determine the completeness or otherwise of the protection afforded by tarred paper have been proceeding for a considerable length of time in reference to *Lasioderma*, but the results to date are not fully conclusive. It appears, however, that if the tarred paper is in one piece and the joints are properly sealed, complete protection of uninfested tobacco may be secured against the moth and probably against the beetle, althougb further experiments are needed for reliable determination of both points.

There seems little doubt that even the wrapping of the bales in the paper, without sealing as in the present practice, has an appreciable protective effect. This has been noted at least in reference to the beetle at Salisbury and should be even more effective against the moth.

It may be mentioned that study of the life history of *Ephestia elutella* at Salisbury indicates that occasional individuals may have very prolonged larval and prepupal stages. The maximum recorded to date is 365 days from hatching to pupation. The actual prepupal, that is, non-feeding larval stage, has in many individuals lasted over the winter months from April to August, but much longer

prepupal periods, extending over 300 days, have been recorded. Development of the insect apparently tends to be resumed as soon as the weather warms up after the winter. These observations need to be extended and duplicated, but it is theoretically possible that actual infestation of a store or warehouse can persist for nearly a year after all sources of food have been removed. This suggests the necessity for *thorough cleansing* of the walls, etc., of the store or warehouse. At present we are advocating hot lime wash for this purpose, although its action on the resting larvæ has not yet been fully investigated.

In conclusion, it may be pointed out that one of the most important factors in reference to control of all pests of stored tobacco is speedy despatch. It has only been under circumstances of a sluggish market and consequent holding of stocks for several years that pests have come into evidence in this Colony as important factors in the tobacco export trade.

KIRKLEY MISSION TO SOUTHERN RHODESIA.

[The following article is reprinted from the "Meat Trades' Journal and Cattle Salesman's Gazette," dated the 12th November, 1931. It is felt that it will be of interest particularly to the cattle owners of the country.—Ed.]

DEVELOPMENT OF THE CATTLE INDUSTRY IN SOUTHERN RHODESIA.

It is only forty years since Southern Rhodesia was first open to European settlement. During the first decade it suffered from rinderpest, from war, and from rebellion. Rinderpest swept the country from end to end, and as late as thirty years ago Southern Rhodesia imported cattle for industrial purposes and for food consumption. The cattle industry is one which has always shown promise, although it has passed through varying fortunes, and the figures which

I now quote will show that the industry is of considerable importance to the European and native population alike. According to the statistics they were—

	European owned cattle.	Native owned cattle.
1917	532,000	551,000
1920	772,000	744,000
1925	1,006,000	1,095,000
1926	991,000	1,197,000
1927	956,000	1,370,000
1928	905,000	1,420,000

The European is more sensitive to economic conditions than the native, and the lack of markets accounts for the diminution in European owned cattle from 1925 to date.

For the last ten years Southern Rhodesia has been a cattle exporting country, but, due to industrial progress in the Colony and in the surrounding countries, the need for export beyond South Africa has not been keenly felt until more recent years.

Since 1925 there have been small shipments of live cattle sent to the United Kingdom for slaughter, the figures being:

1925.	1926.	1927.	1928.	1929.	1930.
236	310	200	140	695	320

Prior to 1925 the principal outside market for Southern Rhodesian cattle was the Union of South Africa, and the following numbers were exported for consumption in the Union in the years indicated:—

1920.	1921.	1922.	1923.	1924.
21,019	7,313	16,716	32,251	46,407

About that time, the Union of South Africa placed a partial embargo on cattle from Southern Rhodesia, the embargo taking the form of limitation of the entrance of cattle beyond a certain weight. In consequence, it became necessary to look for other markets, and coincident with the partial closing of the Union of South Africa market, a new market opened in the Belgian Congo. The exports from Southern

Rhodesia to the Belgian Congo from 1925 to 1930 were as under:—

1925.	1926.	1927.	1928.	1929.	1930.
4,768	9,016	20,302	26,833	23,956	24,093

In addition, substantial numbers of breeding cattle were sent to the Congo, but their numbers need not be quoted here. Besides the opening up of the Congo market, arrangements were made with a cold storage company to establish itself in Southern Rhodesia and to undertake the purchase of cattle and the export of frozen meat beyond South Africa. The figures quoted below are of the export for the years 1925 to 1930:—

1925.	1926.	1927.	1928.	1929.	1930.
35,675	49,595	16,246	27,123	33,305	21,775

It may be of interest to quote the figures of export to the Union of South Africa market during the same period, the export being confined to live cattle of 1,000 lbs. weight and over:—

1925.	1926.	1927.	1928.	1929.	1930.
9,591	12,250	7,244	10,369	7,214	7,466

I do not want to burden this memorandum too much with figures; I would like to say, however, that since 1920 Southern Rhodesia has exported 540,000 head of cattle, and the following are the exact figures for the years 1925 to 1930:—

1925.	1926.	1927.	1928.	1929.	1930.
60,543	74,821	46,898	71,429	73,615	60,871

The internal markets, i.e., the Union of South Africa, Northern Rhodesia, the Belgian Congo and Portuguese East Africa, are limited markets. The Union of South Africa are themselves large breeders of cattle, and have to seek an outlet outside of South Africa in the same way as ourselves, so that no further expansion can be expected for Southern Rhodesia in that market. The needs of Northern Rhodesia and the Belgian Congo vary with the progress of those countries. Northern Rhodesia is also a cattle-breeding country. There is no reason to expect any substantial increase in the numbers that can be sent north.

The major portion of the frozen meat which has been exported up to date has gone to Italy. The Italian market, to date, has not demanded the highest class of cattle; we can only expect a portion of the market that does exist there, and it is necessary, if there is to be any extension of the live stock industry in Southern Rhodesia, that ways and means should be found of breeding the type of cattle required for the trade in the United Kingdom, of finding means of transporting cattle to port, and of having the necessary facilities for transporting the animals in the form of chilled meat from the port to the United Kingdom, and for the reception and distribution on its arrival there.

Officials in Southern Rhodesia have estimated that the country is capable of carrying eight million to ten million head of cattle and it is reckoned that all the cattle at present in the country could be doubled by natural processes in a period of seven years.

The leaders of the live stock industry in Southern Rhodesia are of opinion that if there is to be any extension of the industry, it is necessary that they should be able to send their live stock to a port within nearer reach of this market than Capetown or Durban, and accordingly the Governments of Bechuanaland, of South-West Africa and Southern Rhodesia, working conjointly, have in the field at the present moment a reconnaissance party investigating the feasibility of building a railway from a point in Southern Rhodesia, through Bechuanaland, joining up with the rail-head in South-West Africa, and thence to the port of Walvis Bay. The possibility of such a line coming within the range of practical politics must depend very largely on the production of increased numbers of cattle in Southern Rhodesia, on the development of live stock as an industry in the Bechuanaland Protectorate, and the finding of markets for the cattle in one form or another in the United Kingdom.

The possibilities of Southern Rhodesia as a breeding ground for the supply of cattle for the provision of meat for consumption in the United Kingdom market have been amply demonstrated by the figures which I have quoted above, and I would like to emphasise the importance of the industry from the point of view of further European settlement in Southern Rhodesia, and from the point of view of increased

prosperity for the native races in that country. It was, no doubt, the recognition of these possibilities which prompted the members of the Kirkley Trade Commission to make the *recommendation they did on* this subject.

Southern Rhodesia is desirous of finding a market in the United Kingdom for live cattle for slaughter purposes, and for what are known as "store" cattle, as well as for chilled and frozeu meat. Giveu the necessary facilities, it is estimated that breeders now could send 10,000 head of cattle annually to this country of the quality which has been consigned to Birkenhead during recent years.

Southern Rhodesian live cattle suffer a disability on entrance into the United Kingdom market, as compared with some of the large supplying countries, and I understand that legislation would be required before it would be possible for Southern Rhodesia to seud store cattle to this country, in the event of such a project being found practicable. Investigation may show that the freight rates would make the ship*ment of store cattle unproductive. The rates being paid at* present vary from £9 to £10 per head, from Capetown to Birkenhead, plus the cost of feeding and attendance.

The outbreak of foot and mouth disease, which unfortunately made its appearance in the Colony in April last, has resulted in a temporary set-back to this promising industry. Fortunately, the disease is of a particularly mild type; the mortality is low, and it is confidently expected that there will be a resumption of the export of live cattle to the United Kingdom. It is not anticipated, however, that a large meat industry will be built up on the export of live cattle alone, and an investigation is now being made with a view to ascertaining the possibilities of exporting chilled and frozen meat to the United Kingdom.

VEGETABLE GROWING IN SOUTHERN RHODESIA.

ONION CULTURE.

By G. W. Marshall, Horticulturist.

Statistical.—

Onions produced in Southern Rhodesia in 1930	4,582 bags
Onions imported into Southern Rhodesia in 1930	11,964 bags
	16,546 bags
Southern Rhodesia onions exported ...	563 bags
Imported onions re-exported	2,875 bags
Total exports	3,438 bags
Total local consumption	13,108 bags

(All bags weigh 123 lbs. gross.)

We are actually producing only about one-third of our requirements, without allowing anything for export. The value of the imported onions in 1929 was £6,678, and in 1930 £4,919.

The foregoing facts were brought to the writer's notice early in October, with a request that the matter be investigated. The outcome of this investigation, which comprised inspecting onions offered for sale by the principal dealers of Mashonaland and Matabeleland and enquiries put to the owners or managers of the stores visited, has revealed the fact that very few Rhodesian growers appear to be sufficiently acquainted with this crop's cultural requirements, the correct method of harvesting it, or the best way of curing and storing onions.

The general impressions gained during the investigations were:—

(1) That onions of excellent quality may be grown in most districts of Southern Rhodesia, and that some varieties, if properly cured, may be stored for lengthy periods.
(2) That faulty harvesting and storage methods result in the loss of a high percentage of the onion crop that should be available for late marketing, also that very few growers make any attempt to grade their crop.
(3) That some growers still persist in marketing inferior onions and thereby give the local article a bad name.
(4) That a definite glut period occurs from November to January, and a period of scarcity from March to September.

Having given a brief summary of the present position in this respect, an attempt will now be made to deal with the many phases of onion culture in an endeavour to enable Rhodesian growers to supply local requirements throughout the year and also to meet the needs of adjoining territories who may not be in a position to provide their own requirements of onions.

General.—The onion is generally classed as a biennial, although some forms, such as the multipliers, are perennial. Since it is grown for its bulbs, the crop is usually treated as an annual. The bulbs vary in colour, being red, yellow and white, with intermediate shades of these colours. The modern globular onion is of comparatively recent development, having been produced by breeding and selection, and is far removed from the wild species to be found in Southern Europe and in the countries bordering the Mediterranean Sea.

The onion is grown in nearly every country and is universally planted in home gardens. It is extensively used for culinary and other purposes, and may be classed as one of the most important vegetables grown. The crop offers special inducement for the employment of intensive methods, and the profits are usually greater than those derived from other crops.

Climatic and Soil Requirements.—The crop may be grown under a wide range of climatic conditions, but it does best in temperate regions without extremes of heat and cold.

The Bermuda, or flat types of onions, thrive best in this Colony, since temperatures here are somewhat higher than those of the principal onion-growing countries of the world, but it should be possible to grow the globular varieties successfully at the higher elevations of some of the eastern districts.

Dry soil and low atmospheric humidity are necessary for the proper ripening of the bulbs, and also for harvesting and curing. Onions require approximately six months to mature, and it is advisable, as far as onion crop plantings are concerned, to arrange the plantings so as to enable harvesting to be conducted during the dry months of spring (August-October).

The best crops are obtained from soils that are retentive of moisture yet well drained; they should be very well supplied with organic matter, should be friable, easy to work, fertile and free from stones and gravel. The land should be practically level to prevent washing, since most onion plantings in this country will be made under irrigation. Sandy loams, when properly enriched with manure and fertilisers, furnish excellent conditions for the successful cultivation of onions. This class of soil is easily worked and produces solid and heavy bulbs of good keeping quality. Heavier loams will also yield profitable crops when properly handled, but should receive a liberal supply of farm manure to prevent baking, which is most damaging if it occurs when the plants are too small to permit of thorough cultivation. Stiffer soils should be avoided, since they become too hard and compact to yield good results.

Seed Supply and Varieties.—Inferior seed is the source of frequent and heavy loss. Seed should be purchased from a reliable seedsman, and it must be fresh, since old seed results in poor germination and weakly plants. The best seed is produced from selected bulbs which are true to variety and type. Many commercial growers prefer to raise their own seed, and this may be done on most farms. The usual procedure is as follows:—

Select as many superior bulbs as may be required during the harvesting period. These should then be thoroughly dried and stored in a well ventilated room. When the bulbs commence growth they should be planted in well prepared and fertile soil, spacing them 9 inches apart in the rows and allowing 3 feet between the rows. The bulbs should be set fairly deep (3 inches to 6 inches) to enable them later to support their heavy seed heads. Some artificial support may be necessary for the seed heads in windy localities; this may be effected by driving wooden stakes at suitable intervals along the rows, tying binder twine to these supports and tying the heads to the twine on either side.

Seed should be harvested as the heads turn yellow and the seeds black. The seeding stems are detached about 6 inches below the heads and are then tied into bundles and hung in a dry store. The bundles should be covered with cheese cloth or similar material to prevent loss of seed. Later, when thoroughly dry, thrash out and winnow the seed. The cleaned seed should then be thrown into a shallow vessel of water to separate the light seed or rubbish which floats on top and which should be skimmed off and discarded. The heavier seed, which sinks, should then be drained and spread out to dry before storing or planting.

In conducting seed raising experiments at the Grootfontein School of Agriculture, Middelburg, Cape, in 1919, the writer collected the bulbs in October-November and planted them the following June. The seed was harvested early in spring. The varieties under test produced from 600 to 1,900 lbs. of seed per acre.

There are many factors that determine the selection of the variety of onion to be grown. These may be summarised briefly as follows:—Colour, size and shape of bulb, quality, keeping properties, yielding powers, soil and climatic adaptation, time of maturity and purpose for which crop is grown, whether for green, dry or pickling onions.

The Natal Red onion has in the past received most attention; it is one of the Bermuda types and well worthy of the place that it has held. Other varieties, namely, Yellow Bermuda, Early Flat Yellow, Cape Straw, White Queen, Silver King and Silver Skin, have given promising results, but the three latter varieties are more suitable for green

or bunching onions. Silver Skin is particularly suited for producing pickling onions. Danver's Yellow Globe, Australian Brown, Prizetaker, Brown Spanish and various other varieties are also deserving of more attention, but they should first be tested in a small way to ascertain if they are suitable to the climatic and soil conditions under which they are to be grown.

Soil Preparation.—Land that is to be planted to onions must receive thorough preparation, and it should be well ploughed or dug and also disc-harrowed or raked several times to produce a fine and even tilth and a firm planting bed. New land should first be planted with other crops requiring cultivation. Potatoes are excellent for this purpose, since they do best on virgin soil. If coarse unrotted manure is to be used for supplying the necessary humus, it should be applied heavily to the preceding crop to thereby overcome the weed factor which is so troublesome when the manure is applied just before planting the onion crop.

Manuring and Fertilising.—In experimental work conducted in the United States of America, it was ascertained that a fourteen ton crop of onions contained 37.8 lbs. of nitrogen, 12.88 lbs. of phosporic acid and 29.26 lbs. of potash. These figures may have some value in indicating the probable needs of onions grown in this Colony. It will, however, be advisable to add considerably more of the plant food elements than those shown by chemical analysis. No other vegetables require higher fertility, and onions must be provided with a bountiful supply of available plant food until the bulbs are well forward.

Farmyard or kraal manure is better than commercial fertilisers owing to its influence on the physical properties of the soil. Poultry manure is of the greatest value because of its high nitrogen contents.

When manure (of any description) is available, it can well be composited with as much farm or garden refuse in the way of well rotted weeds, old grass, ashes, etc., as are available, and should be applied when the whole has been reduced to a well rotted mass, and most of the weed seeds have been thus destroyed. The compost should then be spread and ploughed or dug in before planting.

The amount of manure to apply depends upon the nature of the soil; 15 to 20 tons per acre is considered sufficient for the average sandy loams of this Colony. When the manure supply is limited, the lands should be sown to a green crop for ploughing in. Sunn hemp is possibly the best crop for this purpose, since it may be sown with the first rains (November) and ploughed in about January, enabling it to rot down before the onion plants are set out in March-April.

In order to raise really payable crops, commercial fertilisers should be used in conjunction with green manures or farm manure, and as a basis to work on it is suggested that 1,000 lbs. of fertilisers containing 4 to 5 per cent. of nitrogen, 8 to 10 per cent. of phosphoric oxide and 8 to 10 per cent. of potash be applied per acre. Soluble nitrogen in the form of sulphate of ammonia or nitrate of soda may also be used with advantage at monthly intervals as a top dressing. Applications should not exceed 50 lbs. per acre; early dressings give best results, and applications should cease at least two months before the anticipated date of harvesting. Onions are gross feeders and are capable of utilising fertilisers when applied at the rate of even two tons per acre, but the applications suggested above should meet requirements in most districts, and prove to be economical.

Sowing the Seed and Transplanting.—In many countries onion seed is sown direct in the field, but this practice is not recommended for Rhodesia, since more even and better sized bulbs may be obtained by transplanting. Furthermore, it costs more to drill, hand thin and seed the *in situ* planted crop, and the additional cost of seed, which amounts to 2 or 3 lbs. per acre, must also be considered. *In situ* planting is only suitable for pickling onions, which are planted thickly to produce small bulbs.

Onion seed soon loses its viability, and growers are consequently recommended to make a small trial sowing in advance of the general seeding and thereby obviate any troubles that may arise from poor germination.

Seed may be sown in any rich and friable garden soil, the beds being well prepared. The usual method is to sow in rows 3 to 4 inches apart, allowing from 10 to 12 seeds per inch of row, and covering the seed with about one half

inch of soil. The seed-beds may be made to any desired dimension, but the 4 by 25 feet size will be found most convenient. After sowing, the beds can be mulched lightly with grass or other suitable material and watered when necessary (usually every evening). The mulch is removed when the seedlings commence to appear, usually about the tenth day; if it is left on too long, the plants will be spindly and more liable to damp off.

With proper care and attention onions should be fit for transplanting in eight to ten weeks after sowing. The transplants are lifted when they are about 9 inches in height and the thickness of a thin lead pencil. The tops are cut off and the roots trimmed back severely, and the plantlets are set from 4 to 6 inches apart in the rows, which should be wide enough to permit of hand weeding and hoeing; 15 inches is an average space between rows. Dibblers are generally used for transplanting, the onions being set at a depth of about 2 inches, after which they are well watered.

The varieties of onions grown from sets and small bulbs from thick sowings may be planted at any season of the year, provided they are about to start growth or the weather is suitable for lifting, dividing and re-planting the multiplying types. The spacing should be the same as that recommended for bulb onions.

Cultivation.—The onion is a shallow-rooted plant, and care must be taken not to injure the roots by deep tillage. Should the soil of the seed-bed become encrusted by heavy rain or faulty watering before germination, remove the mulch and rake lightly. The field encrustation may be rectified by harrowing or raking and then rolling lightly immediately before transplanting or by loosening the soil between the growing crop with a wheel hoe or pronged hoe of the "Norcross" type. Straight rows and uniform spacing are essential for good and thorough cultivation.

Cultivate when the soil is fit after each irrigation or rain. All weeds should be kept down by hoeing and hand pulling, and cultivation should at all times be very thorough, since good crops can only be produced on clean lands.

Irrigation.—Damp vleis if properly handled and drained may be used for growing onions, but they should be of a type

that can be dried out when the crop has bulbed, since onions of good keeping properties may only be produced on such land. With the foregoing exception, onions cannot be grown in Southern Rhodesia without irrigation. If the lands are dry they should be flooded before planting and again afterwards at weekly intervals until the bulbs are well formed; water should then be withheld to induce ripening.

Onions make rapid growth early in the season, and care must be exercised that the crop does not suffer for want of moisture, since crops stinted in this respect seldom bulb satisfactorily.

Rotation.—The onion is one of the few vegetable crops that may be grown successfully for a succession of years on the same land. This is an advantage, since the soil requires to be so well worked and must receive such thorough preparation and treatment. Rotation is only necessary when pests and diseases make their appearance.

Harvesting and Storage.—Faulty harvesting methods are primarily responsible for the failure to adequately supply our own onion requirements. Although the crop is successfully grown in most districts, it is surprising to find so high a percentage marketed in a wet or green condition, little or no attempt having been made to dry, cure or grade the product. Artificial gluts are unfortunately very frequent early in the season. High prices result in the flooding of markets with uncured, damp onions which have no keeping properties.

If the Colony is to supply its own onion requirements and build up an export trade for any surplus, more care will be required in the handling and subsequent storing of the crop.

For the production of good keeping onions, plant varieties known to be good keepers and harvest them when the bulbs are fully developed and the tops are still green. The fields should be gone over at least once a week and all the bulbs lifted that have soft necks; this condition is easily ascertained by the harvester squeezing the neck (portion between the bulb and top) of the onion between the thumb and finger. The harvested onions should then be placed in wind-rows and arranged in such a manner that the green tops of the last bunch adequately cover the bulbs of the preceding

bunch. This is very important, since onions are so easily damaged by sunburn, which also causes the bulbs of white varieties to turn green. If the bulbs are well protected, the onions may be left in the wind-rows for one or two weeks or until they are thoroughly dry. Those that are to be stored should then be plaited into strings—doing this work early in the day when the tops are damp and flexible and making each string about 6 feet in length and 25 lbs. in weight. This is a convenient size and weight to handle. The string onions should then at once be taken carefully and without bruising to the curing shed and hung where they are to remain pending disposal. The strings may be hung over taut wires or laths in such a way that the centre will rest on the support used. If the curing building is high, several tiers of onions may hang one above the other, but care should be taken to ensure sufficient ventilation to prevent heating.

When it is intended to market a portion of the crop from the field, harvest and place in wind-rows as already described. The bulbs should be thoroughly dry, and the tops can then be twisted off at the necks, at the same time rubbing off the dry scales and roots. The bulbs are next graded and placed in sacks of 123 lbs. gross. In grading, all onions that have failed to bulb should be discarded, also those that have thick and hard necks, and particularly any that may have seeded; onions of this type will quickly rot and may ruin the whole contents of the bags.

Early onions should be marketed in crates, since they are liable to serious damage when bagged. Suitable returnable crates holding 50 to 100 lbs. each are now procurable from local sawmills, and any additional cost that may be incurred in purchasing the crates will be offset through obtaining higher prices for the well packed product.

UMVUMA WHEAT EXHIBITION, 1931.

A very successful wheat exhibition was held at the Court House, Umvuma, on Friday, the 11th December, 1931. It was opened by Lieut.-Col. Guest in the absence of the Honourable the Minister, who was unavoidably detained at headquarters by the inter-State conference on foot and mouth disease.

Thirty-five exhibits were shown, of which thirty-two were in the "bag" classes.

Unfortunately, owing to the difficult times farmers are experiencing, no entries were received from the Fort Victoria district, and only one from Enkeldoorn.

The condition in which exhibits were put up showed a marked improvement over last year, but there are still indications that greater care is necessary in preparing grain for the bulk exhibits.

Very valuable prizes were provided by the various firms interested in wheat growing in this Colony, including the Rhodesian Milling & Manufacturing Company, Ltd.; Massey Harris, Ltd.; African Explosives, Ltd.; Messrs. Meikles (Gwelo), Ltd.; Harris Bros., Bulawayo; Fisons' Fertilisers, Ltd.; Anglo-African Trading Company, Ltd.; E. W. Tarry & Co., and a special cup was presented by Lieut.-Col. Guest, M.L.A.

The strongest class was undoubtedly that grown on vlei land without irrigation, and in this the competition was very keen. The special prize in this class was won by Mr. E. G. Raubenheimer, with an excellent bag of Burbank's Quality wheat.

It is interesting to note that the best bag of milling wheat on the show was also grown on wet vlei land. The possibilities of wheat growing in Rhodesia without irrigation were, therefore, well demonstrated at this exhibition, and it is hoped that this and subsequent exhibitions will have a wide effect in stimulating a branch of the agricultural

industry for which considerable scope exists in this Colony. With greater experience in this type of vlei farming, coupled with suitable varieties combining both yield and quality, it is conceivable that this Colony will, in the near future, be in a position to produce most of its own requirements of wheat.

The arrangements for this exhibition were all that could be desired and reflect great credit on Mr. E. T. Palmer, the Native Commissioner of Umvuma, and the members of the committee who assisted him.

MATOPOS SCHOOL OF AGRICULTURE.

The first annual prize-giving and presentation of diplomas took place at the Matopos School of Agriculture on Saturday, the 12th December, 1931. A large number of visitors attended and spent an enjoyable afternoon inspecting the different activities of the school, the live stock, etc.

It was arranged that the Honourable the Minister of Agriculture and Lands should present the prizes. This was unfortunately impossible owing to the inter-State foot and mouth disease conference, which necessitated his remaining at headquarters. The prizes were therefore distributed by Mr. H. G. M. Huntley, the chairman of the Matabeleland Farmers' Association.

Five students received diplomas on the completion of the two years' diploma course at the school. These were Frank T. Eriksson, of Insiza, who obtained honours in animal husbandry and crop production; Rodger K. Cook, of Kingston, England, with honours in animal husbandry; John A. Press, of Cambridge, England; Norman Cook, of Kingston, England; and James D. Paterson, of Edinburgh.

The following six students were granted certificates on the successful completion of the first year's examinations:— Benjamin Barry, Umtali; Jack Green, Marandellas; Alfred Honey, Johannesburg; Norman Leonard, London; Gregory Wilson, Gwelo; Allan Glieman, Northern Rhodesia.

The Director of the Rhodes Matopos Estate, Dr. D. G. Haylett, reviewed the work of the year and indicated the lines along which the future policy of the institution would probably develop. He stated that it was very encouraging to be able to inform the gathering that posts had been obtained with farmers in the country for all the students leaving the institution this year. He expressed the appreciation of the school to the numerous firms who had kindly donated prizes, and to Messrs. Huntley, Brebner and Bett for a shield for the student obtaining the highest number of marks in stock-judging, and to Mr. E. S. White, of Mazoe, for presenting a floating trophy to be competed for annually for maize-growing.

The "Farmers' Weekly" gold medal was won by F. T. Eriksson, the silver medal going to Norman Cook. F. T. Eriksson also won the silver cup presented by Dr. and Mrs. Haylett for the best all-round student of the year, and also the shield for stock-judging.

Mr. G. H. Cooper's prize for poultry went to John A. Press, who also won Mr. White's floating trophy for maize-growing.

It should be noted that from the beginning of next year the school year at the Matopos School of Agriculture will be on a three-term basis, and the following is the school calendar:—

School term begins Monday, 18th January, 1932.

First term ends Thursday, 5th May, 1932.

Second term begins Monday, 23rd May, 1932.

Second term ends Thursday, 18th August, 1932.

Third term begins Monday, 26th September, 1932.

Third term ends Thursday, 15th December, 1932.

ARTIFICIAL SILK OR RAYON.

Artificial silk is the erroneous name given to the products which have been for some time on the market in competition with natural silk. There are several more or less similar products in this class produced in various ways, all similar, however, in one respect, i.e., that they are derived from cellulose. There is no chemical similarity between the so-called artificial silks and natural silk produced by silkworms, and for this reason it is undesirable to retain the common name generally used. The Americans have discarded the name "artificial silk" in favour of "Rayon." Rayon, with the exception of the finest "cuprammonia silk," which has been produced by the "stretch-spinning" process, cannot compare with real silk in fineness nor in strength, but it possesses the lustrous appearance of silk and may be used to advantage woven with real silk without losing the silk-like appearance of the finished product. For this reason it tends to increase the utility of real silk rather than to oust it from the market. Recent figures from the United States of America illustrate this point very definitely, and also indicate the surprising growth of the Rayon industry.

U.S.A.	Real Silk.		Rayon Yarn.	
Year.	Available for use.	Average price per lb.	Available for use.	Average price per lb.
	Lbs.	$	Lbs.	$
1911	29,507,000	3.471	1,143,000	?
1915	36,958,000	3.318	6,818,000	2.0
1920	38,798,000	8.277	12,039,000	4.5
1925	76,003,000	6.341	64,265,000	1.8
1929	96,848,000	4.777	142,384,000	1.1

Cellulose is the only source from which Rayon is produced in quantity, and is likely to remain so. Waste silk, casein, gelatine, egg albumen and agar-agar have been tried, but without success. Cellulose, in its wide botanical sense, is the name given to a group of substances which are elaborated by the living plant cells to provide cell-walls and per-

manent structures. From the Rayon manufacturers' point of view cellulose implies cotton lint or linters and refined wood pulp. To produce Rayon from cellulose, four industrial processes have been developed:—

(a) the Chardonnet or nitro process;
(b) the Cuprammonium process;
(c) the viscose process; and
(d) the acetate process.

In all of these the essential points in the manufacture of the threads are identical. The cellulose is brought into such a condition that it can be dissolved or suspended in a liquid which is forced through very minute holes which imitate the silkworm's spinnerets. As the liquid emerges in a very fine filament it is "set," either by evaporating the liquid contained in the thread or else by coagulating the material by means of a "setting bath." It will be noticed that the former or "dry" method is similar in principle to the spinning process of spiders and caterpillars, and the idea of copying this process was suggested by Robert Hooke in 1664. It is not known, however, that any actual attempt was made to copy this principle until the work of Comte Hiliare de Chardonnet took out a patent for Chardonnet or nitro-silk in 1884-5. Chardonnet, years before, had been a student at the Polytechnic School of Paris under Pasteur during the latter's investigations on silk worm disease, and it is probable that this was the source of the inspiration that started Chardonnet on his life work.

About this time numerous investigations were carried out to discover, if possible, a suitable carbon filament for electric lamps, and the solution of the problem lay in the method adopted in producing Rayon, i.e., reducing cellulose to a state in which it could be squirted through a hole of definite dimensions and carbonising the filament obtained.

The Chardonnet or Nitro-Process.—For the production of nitro-silk, cotton linters have been found to give the best results. The clean, oven-dried cotton is immersed in 40 to 80 times its own weight of a mixture of water, sulphuric acid and nitric acid for about one and a half hours. After nitration is completed, the surplus acid is removed and the nitro-cotton is bleached if necessary, washed and dried. The nitro-

cellulose so obtained is very similar in appearance to ordinary cotton, but it is now soluble in either a mixture of alcohol and ether or in acetone. The former is generally employed, and a 20–30 per cent. solution is used for spinning. Nitro-cellulose, however, is both inflammable and explosive, and it is necessary, therefore, to remove the nitro-groups from the spun filaments, and this is done by soaking in a solution of *sodium, ammonium or calcium sulphide.*

The Cuprammonia Process.—This process was patented by *Depeisses in 1890, and was developed in England*, France and Germany with the object of establishing a more economical process than the nitro-cellulose process, chiefly by avoiding the use of alcohol and ether, which are very heavily taxed. It has attained a very special hold on the market owing to the fact that the filament obtained can be subjected to stretching during its gradual coagulation. In this way, even though spinnerets with comparatively large *orifices are used*, the *finest filament can be spun, surpassing* natural silk in fineness.

In 1857 E. Schweizer discovered that cellulose would dissolve in the blue solution obtained by dissolving copper hydroxide in ammonia, and the solution became to be known as Schweizer's re-agent, which was specified in the original patent obtained for this process. Latterly, the more usual procedure has been to treat the cellulose—cotton linters in France and bleached wood-pulp in England—first with a mercerising solution of sodium hydroxide and then in a copper sulphate solution, which causes a very intimate incorporation of copper hydroxide in the mass. The surplus copper sulphate solution is then squeezed out, and the mass is immersed in strong ammonia solution in which it *dissolves* rapidly, to give a high concentration of cellulose.

The Viscose Process.—*This* is the most generally employed process for the production of Rayon, and it is estimated that it provided a world's output of no less than 235 million pounds in 1927, i.e., 84 per cent. of the total output. Wood-pulp is almost exclusively used for this process, and the bleached cellulose is first treated with a mercerising solution of sodium hydroxide for about two hours. The surplus solution is then squeezed out, and the resultant alkali-

cellulose is torn into crumbs, which are matured for 24 hours more in a closed vessel. Sixty parts of carbon bisulphide to every 100 parts of cellulose are then added, and the cellulose crumbs gradually swell and become deep orange-coloured and gelatinous in three to four hours' time. After the further addition of an appropriate quantity of sodium hydroxide solution and water, a viscous solution is obtained, which is left to ripen until it is in a fit state for spinning. The viscose is filtered and spun by the wet process, i.e., from spinnerets immersed in a "setting" bath of sulphuric acid and sodium sulphate.

The Acetate Process.—This process, utilising cellulose acetate, is not used to any great extent for the production of Rayon, but, owing to the non-inflammable nature of the product, is used more extensively in preparing cinema films, dope for aeroplanes, etc. For the latter purpose a factory costing more than seven million pounds was erected at Spondon, Derbyshire, during the war.

Cellulose acetate is prepared from cotton linters by treating with acetic anhydride, a suitable quantity of glacial acetic acid and about 10 per cent. of sulphuric acid as a catalyst. It is less absorbent of moisture than any of the other so-called "artificial silks" and is an excellent electric insulator.

Uses of Artificial Silks.—The most valuable property of artificial silk is its great lustre, which exceeds that of natural silk and permits of its use for a large number of different articles. Beautiful new effects are obtained by using it as a weft in figured textiles with warp of natural silk, a new opening being thus provided for the latter. It is also used with advantage as weft in silk ribbons. For some years it has held almost undisputed sway in the lace industry. Fringe and cord for ornamental garments, lace, embroidery, etc., are now largely made from artificial silk. Special articles which cannot be obtained with natural silk are made from the artificial product. There is now a large consumption of artificial hair prepared from artificial silk by fusing together several thin fibres so as to form a single large compact filament, which, unlike large fibres obtained directly by spinning, is flexible and resistant.

Another interesting application of artificial silk is in the manufacture of incandescent gas-mantles according to Plaisetty's patent; such mantles are more resistant to shock even after burning, and can be used in trains.

Largely used also is a new product obtained from viscose, namely, a kind of ebonite, which serves well for the manufacture of artistically worked and coloured umbrella handles, knife handles, etc., and resists the action of the acids and alkalis with which it is likely to come into contact.

Casein products, which have also been suggested for these purposes, cannot compete with viscose ebonite, which exhibits marked advantages over bone and horn in the manufacture of brushes, as it can be more easily worked and more easily pierced to allow of the fixing of the bristles.

As hair ornaments for ladies, great use is made of artificial silk in thin sheets or ribbons showing brilliant colours and sparkle. Artificial silk is also used in large quantity for making materials for tapestry, upholstery, neckties, hat-linings, etc.

Viscose has been largely used in recent years to prepare cellophane, which is highly elastic, and its elasticity, tenacity and impermeability are increased by treating it with glycerine. It can be stamped so as to produce artistic effects. Considerable use is made of it as wrapping for meat, cakes, tobacco and cigarettes, sweets, perfumed substances, etc., which are thus protected against water, fatty matters and gases. Cellophane resists alcohol and water even at boiling temperature, and has been proposed as a suitable material for making cinematograph films and for rendering fabrics water-proof.

C. K. B.

FOR SALE.

Pedigree Australorp - Plymouth Rock (imported) Cockerels (35/-) and Pullets (12/6), from prize-winning strains.—*Inyashuuti Poultry Farm*, Penhalonga.

FARMING CALENDAR.

January.

BEE-KEEPING.

This month is a slack one for actual hive work. Each hive should continue to be carefully watched to see that any attempt by the wax moth to gain a footing is at once stopped. In the great heat of this month, see that proper ventilation is supplied, as well as enough water. Precautions against the depredations of white and other ants should also be watched daily. Where possible, examine now and again the brood chamber for queen cells, and destroy them if not wanted. Requeening can be done where desired on the uniting system, if the apiarist does not know of the better plan of rearing his own queens. In the workshop have a spare hive or two complete and ready for occupation, well painted, for any new swarms that may be required in the coming months. Though the second honey flow of the season is not due to start until about March or April, there should be ample stores coming in meanwhile to keep all bees busy in breeding, nursing, and bringing the hive generally to full strength for the winter, as well as for their own daily food supplies. There will not be enough honey coming in now for surplus purposes, therefore see that the supers are not left on the hives to a greater degree than to give the inmates plenty of room to loaf in.

CITRUS FRUITS.

The planting of citrus trees should be completed if possible by the end of the month, for trees planted later may not harden up before the winter; they then become susceptible to winter injury from cold. This month is the best one for planting shelter belts to protect all varieties of fruit trees from the prevailing dry winds. Cover or green crops may be planted during this month; if the grove has been over-run with grass or weeds, sow the cover crop seed more thickly. This will assist in smothering future weed growth. Continue suppressing any undesirable shoots that may develop on the tree trunk or other parts of the tree. Drain any depressions that allow rain or irrigation water to accumulate at the base of the trees, for trees permitted to stand in water will speedily fall victims to disease or pest injury.

DECIDUOUS FRUITS.

Continue planting cover or green crops between the trees. These crops may then be turned under towards the end of the rainy season to furnish the necessary humus.

Summer pruning may be continued. Rub or break off any undesirable shoots that have a tendency to crowd each other; suppress all growths on the main stem from the ground level up to the main arms of the tree, for these are unnecessary. If next year's fruit crop is to be of good size and quality, the inner fruiting wood of a tree must receive sufficient air and light to mature fully. If the new growth is too dense it will prevent the fruiting wood from maturing, and poor crops will be the result. The thinning out of the summer growth will overcome this crowding and weakening of the fruiting wood.

Many fruits will be ripening during the month. Do not permit the fruit to become over-ripe on the trees; rather harvest it at the correct stage and store or sell the surplus.

Plant shelter trees if the orchard is exposed to the prevailing winds, as good crops of fruit cannot be expected from inadequately protected fruit trees.

CROPS.

If not already sown, put in the ensilage and fodder crops at once, such as maize and legumes, oats and other hay grass crops. Sow short season crops like haricot beans, linseed, buckwheat, peas, summer oats, gram and mung bean. Plant out grasses and kudzu vine for pasture. Ridge potatoes and cultivate thoroughly. Main crop can still be planted. Quick growing green manuring crops, such as cowpeas, soya beans and sunn hemp, may still be sown this month. Earth up ground nuts so that a small amount of loose soil is thrown over the crowns of the plants. This assists the formation of nuts. If not already done and where practised, legumes or long season oats such as Algerian can be sown under the maize crop for grazing and to add nitrogen and humus to the soil. Cultivate all growing crops well, and thoroughly eradicate weeds. Overhaul all hay-making implements and ploughs and get in thorough repair in preparation for the haying and ploughing seasons. Endeavour to mow grass fields early for hay and litter, and to obtain second cutting for hay in April. Fallowed lands or fields not yet planted may be disc-harrowed or ploughed to prevent weeds from seeding. Mow grass paddocks infested with annual weeds to prevent the weeds seeding. Prevent Mexican marigold and other noxious weeds seeding by hoeing or pulling out the plants by hand. Keep a sharp look-out for maize stalk borer. Cut off the tops of infested plants or treat them with a recognised chemical preparation. If topping is practised, remove tops from land, and bury, burn or feed them at once to farm stock. Watch the maize lands for witch weed. Prevent witch weed plants from seeding by cultivation and by hand-pulling the plants. Make as much manure as possible by placing grass and litter in cattle kraals, pig sties and stables. If there is stumping and clearing to be done, push on with it. Endeavour to get as much of the new virgin land as possible broken up during this and the two following months.

DAIRYING.

During the months of December and January veld grazing is usually plentiful, and very little extra feed in the form of concentrates is required for dairy stock. It should be borne in mind, however, that heavy milking cows are unable to satisfy their requirements for milk production from veld grazing alone, and should receive a daily allowance of grain; the latter should be fed at the rate of 2 lbs. for every gallon of milk produced daily, i.e., a cow producing three gallons of milk should receive 6 to 7 lbs. of concentrates. An excellent mixture for this purpose is one consisting of four parts maize meal and one part ground-nut cake.

During wet weather, the provision of a clean dry shelter for calves is essential; the latter should not be crowded together in a small, damp, badly ventilated pen or muddy kraal. When treated in this manner, a calf is very liable to contract various ailments such as scour, etc. Scour is entirely preventable, and is usually caused by over feeding, or feeding from dirty pails, feed boxes, etc. Calves which contract scour should be isolated, the milk ration reduced, and they should be dosed with a few tablespoonfuls of castor oil.

Under the weather conditions which now obtain, cream should be despatched to the creamery at least three times a week. It is of the greatest importance that cream should be cooled immediately after separation, and should be kept cool while on the farm and whilst in transit to the railway station or siding. While the cream is being cooled, it should be frequently stirred, using a stirrer with a plunger attachment. Warm, freshly separated cream should not be mixed with old cream which has already

been cooled. Cool the fresh cream first and then mix thoroughly with the old cream. Gassiness is a common defect in the cream received at the creameries at this time of the year, and is caused by gas-producing organisms with which the milk and cream are contaminated. These organisms abound in mud, manure, etc., and develop and multiply very rapidly at high temperatures. Any precautions therefore which may be taken to eliminate dirt, manure, etc., from the milk and to keep the cream cool will prevent the development of gassiness.

As the night temperatures are fairly high, cheese-makers should not attempt to use night's milk for cheese-making; morning's milk plus a starter will give the best results. Gouda cheese-making operations are not usually successful at this season of the year, owing to the poor quality of the milk and the prevalence of gassiness. This type of cheese is best manufactured during March and subsequent months.

ENTOMOLOGICAL.

Maize.—Late planted maize, particularly crops planted after the New Year, are frequently attacked by the maize stalk borer (*B. fusca*, Full.) in districts where this pest is prevalent. The yield of grain from heavily attacked stands is usually very low, and such crops are most economically used as ensilage. Plants attacked are easily detected in the fields, as the newly hatched caterpillars eat the young leaves before entering the stalk. Top dressing with a suitable insecticide should be employed to ensure a good yield. There are several insecticides which can be used for top dressing which kill the young caterpillars without causing severe injury to the plant. Kerol, Kymac or Hycol used at a dilution of 1 in 300, or Pulvex, 1 in 54 gallons of water, give satisfactory results. A new preparation, Derrisol, is highly recommended by the manufacturers at 1 in 1,000, and is stated to be quite innocuous to the plants. The liquid should be poured into the funnel-shaped cup formed by the young leaves. Only those plants showing attack are usually treated. With a light infestation, one native can treat about five acres per day. Several treatments may be necessary. Young maize plants up to six weeks old can be treated by cutting the plant below the point attacked. The portions cut off must be removed from the lands.

Various leaf-eating insects (including the snout beetle (*Tanymicus destructor*), the surface beetles, grasshoppers, etc.) attack young late-planted maize.

The attack by the snout beetle may be very severe. If there is time, it is often advisable to harrow in the old crop, treat the land with poison bait and re-plant, or poison bait may be used without removing the crop. The best carrier for poison bait is chopped Napier fodder or some other green succulent grass, including maize itself; failing this, maize or wheat bran may be used. The carrier is thoroughly covered or impregnated with a solution of arsenite of soda 1 lb., molasses 1½ gallons, or cheapest sugar 8 lbs., water 10 gallons, and broadcast. The cheapest arsenite of soda to employ is locust poison, diluted 1 in 200, and equivalent quantity of sweetening agent added. The best results are obtained if the broadcasting is done in the evening, as the hot sun dries up the bait too quickly and renders it unattractive to the beetles.

Army Worm (*Laphygma exempta*) may put in an appearance during the latter half of December, and a sharp look-out should be kept for the caterpillars, especially on sweet grasses near the maize lands and on "rapoko grass" (*Eleusine indica*) on the lands. (See *Rhodesia Agricultural Journal*, October, 1930, page 1055.)

Black Maize Beetle.—Both larvæ and adults of this beetle are active during this month. Hand collecting of the adults is the only practical procedure. For further control measures, see *Rhodesia Agricultural Journal*, February and April, 1925.

Potatoes.—This crop, if attacked by leaf-eating ladybirds, blister beetles or other leaf-eating insects, may be sprayed with arsenate of lead

(powder), at the rate of 1 lb. in 25 gallons of water. This poison may be combined with Bordeaux Mixture when spraying against early blight. To protect potatoes from potato tuber moth, the rows should be ridged deeply and the tubers kept covered with soil.

Tobacco.—Tobacco in the field is attacked by many insects during this month, and growers should keep a copy of Bulletin No. 665, "Tobacco Pests of Rhodesia," handy for reference, or refer to *Rhodesia Agricultural Journal* for January, 1928. The following very brief account of the more common insect pests attacking this crop may help the grower who cannot consult the above-mentioned bulletin.

Cutworms.—Keep all lands free from weeds up to the time of planting out.

Stem Borer.—All seedlings showing the characteristic swelling should be destroyed by fire. Plants in the field should be destroyed and replaced, or the plant may be cut off below the swelling and one sucker encouraged to grow. The latter procedure needs to be carried out early.

Leaf Miner.—All primings should be destroyed, and infected leaves may be picked off.

Seed Beds.—Seed beds which are no longer required should be cleaned up and not allowed to become a breeding ground to infest the fields. Beds in use should be kept properly covered with limbo and sprayed weekly with arsenate of lead, 1 lb. in 30 gallons of water.

Wire Worms (*Trachynotus* spp.).—Several species of wire worms attack this crop during January, particularly on sandy soils. It is now too late to attempt control. Control depends upon the accurate timing of the emergence of the adult beetle and poisoning with a poison bait. Emergence usually takes place late in April or in early May. The bait consists of maize meal or bran poisoned with arsenite of soda (locust poison, 1-200). The bait is made up into balls, scattered about the lands. The balls should be covered with leaves, to give attractive shade and to assist in keeping the bait moist. Moisture should be added when necessary.

Surface Beetles (*Zophoses* spp., *Gonocephalum* sp.).—The same control measures apply as for wire worm. Baits recommended against wire worm can be applied during January. No sweetening matter is necessary.

Bud Worm (*Heliothis obsoleta*).—Destroy all caterpillars by hand during "topping." Examine all bagged seed heads weekly and destroy any caterpillars discovered.

Other Leaf-Eating Caterpillars.—A bad attack in the field may be controlled by spraying with arsenate of lead (powder), 1 lb. to 30 gallons of water. A knapsack spray pump with a cyclone nozzle is necessary. Hand picking may be employed.

Beans, Cowpeas, etc.—Haricot beans and cowpeas are liable to attack by the stem maggot (*Agromyza* sp.). This small fly deposits its eggs in the young leaves, often within a few days of germination. The larvæ mine along the veins and down the stem, pupating about soil level. Practically nothing can be done to protect a field crop. Velvet beans, Jack beans and dolichos beans are not attacked by this pest.

All varieties of beans are attacked by a leaf-eating beetle (*Ootheca mutablis*). This small insect can be controlled by spraying with arsenate of lead (powder), 1 oz. to 3 gallons of water.

Blister beetles are often very numerous on the flowers of all species of beans and cowpeas. Hand collecting has been found to be the most economical measure.

The bean stem weevil is a minor pest of beans in the kitchen garden. All plants attacked by this weevil should be picked out and burnt.

Sweet Potatoes.—Sweet potatoes may be attacked by caterpillars of the sweet potato sphinx moth. These should be collected by hand.

Kitchen Garden.—Marrow and cucumber plants about to set fruit may be sprinkled regularly with the following formula to destroy fruit flies which "sting" fruit:—Arsenate of lead (powder), 1¼ ozs.; molasses, ½ gallon, or cheapest sugar, 2½ lbs.; water, 4 gallons. To destroy leaf-eating insects generally, dust plants with arsenate of lead (powder), 1 part in 20 parts of finely-ground maize meal or finely-sifted slaked lime. *Aphides* (plant lice) may be treated with soap, 1 lb. in 5 gallons of water, or tobacco wash, or simply by regular spraying with a forceful stream of cold water from a spray pump.

Fruit Trees.—Deciduous fruits are subject to attack by large beetles, which should be destroyed by jarring into a net and dropping thence into a tin containing water, with a film of paraffin on the surface. Trees should be covered in mosquito netting to protect the fruit from fruit-piercing moths. The large adult beetles of the fig borer may be seen on the young shoots and should be destroyed. Borers in the trunks of the trees may be killed by injecting a little carbon bisulphide.

Mosquito, House Flies, etc.—Screen windows and doors. Destroy breeding places around homestead. House flies may be poisoned cheaply with sweetened arsenite of soda solution. Write for directions.

When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.

FLOWER GARDEN.

This month requires all one's energy in the flower garden. Annuals may still be sown for late flowering before the season is over. Planting out should be done as early as the weather permits, and advantage taken of a dull day after a shower for this work. If care be exercised much smaller plants may be put out than would at first be thought advisable, as with attention these will make stronger plants than larger ones, which are more likely to receive a check. The soil requires constant stirring, owing to the packing caused by the rains and for the eradication of weeds, which are now very troublesome. All plants should be kept free of dead and decaying matter.

VEGETABLE GARDEN.

Turnips, carrots, cabbages, lettuce, etc., may be sown for carrying on during the winter months. Potatoes may be planted this month for keeping through the winter. Weeding and cultivating between the rows should be continually carried on.

FORESTRY.

If the rains are seasonable, plant out evergreen trees, such as gums, cypress, pines, etc. Fill in all blanks as soon as they are noticed, and do not leave them until the following season. Planting should be done on a wet day, or, failing that, on a dull day, or late in the afternoon. Great care should be taken to see that the trees are not planted out any deeper than they stood in the tins.

POULTRY.

All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs.

Foodstuffs must be kept absolutely dry, otherwise they will become mouldy and sour, causing disturbance of the intestinal tract, illness, and perhaps death; certainly a diminution in the number of eggs.

Some of the birds will now be in moult. To get them through it quickly give more sunflower seed, some monkey nuts, plenty of green food, especially cabbage, kale, etc., plenty of milk or some meat, a little sulphur in the dry mash (one teaspoonful to 1 lb.); also stew two dessert spoonfuls of linseed in a pint of water to a jelly, mix this to a crumbly consistency with mealie meal or bran, and give about one dessert spoonful to each bird daily. Keep the birds dry during the rains, otherwise the egg output will decrease.

Do not hatch any more turkeys till after the rainy season is over. Turkeys should not be penned up, but allowed on free range.

Ducks must be treated in almost exactly the reverse manner to what turkeys are. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, mealie meal, meat meal and milk, as much as they will eat three times a day, *i.e.*, they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

STOCK.

Cattle.—The recommendations for December apply equally to this month. Bulls should be returned to the herd during the month if a September or October calving season is desired.

Sheep.—Continue as recommended for December. If heavy rains are experienced a daily ration of a quarter of a pound of maize per ewe will keep them in condition, and will often prevent much trouble arising from poverty and anæmia. Those who favour autumn lambs must put the ram again with the flock in February, and should therefore now take steps (if necessary) by supplying a little extra feed as above recommended to fit the ewes for mating. A little forethought of this kind will tend to increase the stamina of the lambs and to bring the ewes in season more or less together, so that a protracted lambing season is avoided.

TOBACCO.

Cultivation should be systematically continued, and no foreign vegetation allowed in the tobacco field, as weeds and grass induce insect attacks. All backward plants should be given special attention, and an additional application of fertiliser to hasten growth, so that the plants ripen as uniformly as possible. Curing barns should be placed in proper condition on rainy days, and all tobacco appliances should be placed in proper order for the rush of work during the curing season. Early planted tobacco may be ready for topping during the latter part of the month, and the common mistake of topping too high should be avoided. Go over the field carefully and select typical, uniform and disease-free plants for producing seed for next season's crop. All plants should be properly primed at the same time that the tobacco is topped.

VETERINARY.

Horse sickness may now be expected, especially in districts where early heavy rains have occurred. Blue tongue in sheep will also be prevalent.

WEATHER.

Heavy rain is to be looked for, and during this month we may normally expect nine to twelve inches on the eastern border, eight in the north, and seven to seven and a half as one travels westwards or southwards. At this time of the year the rainfall tends to be heavier in the eastern than in the western portions of the Colony, whilst prolonged steady rains take the place of the thunder showers which marked the earlier part of the wet season. The growing period is at its height, and high temperatures are registered.

February.

BEE-KEEPING.

In most parts of the two Rhodesias this month is one of fair activity for all bees, there being as a rule quite enough nectar, pollen, etc., available for all ordinary purposes of rearing, building cells, etc., and working generally for the due upkeep of the colony for the present as well as for the coming winter. Whether there will be any surplus honey for them to store will depend npon what crops the farmer may have on hand at this time, as the usual flora of the land will not supply it until the regular second flow of the year is due, which should be in March to April, according to the season.

Watch carefully for robbers, though, with well attended hives and due care in handling, there should be little to fear in this direction; strong, well filled hives can always repel robbers, which are only successful with weak colonies, and these no apiarist should ever have under his care. Mark well last month's advice, i.e., to have everything in readiness for dealing with unexpected new swarms that may be required as they may come, for nothing is more disconcerting or annoying than to be unready when the time arrives. This applies especially to any swarms that may come from the apiary, for a few days only of neglect of such a hive may easily lead to the moth taking early possession of the combs, and in practically a few hours destroy fully drawn-out combs that would otherwise be of much value for after working upon. Such combs, as they are available, should at once be packed away in an air- and moth-tight box or tin for after usage.

CITRUS FRUITS.

Newly-planted citrus trees should be kept free of weed growth likely to exclude necessary air and light for their normal and healthy development. Citrus trees planted in February seldom give satisfactory results; late planted trees do not mature their new growths before winter, and they are more susceptible to winter injury or the ravages of disease or insect pests. The early planted cover crops will be fit to plough under by the end of the month. Do not delay this operation for fear of the rains ending abruptly. If this occurs, great difficulties will be experienced when attempting to plough in the green crops. Keep all young shelter belt trees free of weed growth, and loosen the soil round their stems fairly frequently to eliminate possible ant injury. This is one of the best months for budding citrus trees, either in the nursery or grove—trees that are to be top worked to profitable varieties. Late out-of-season fruit that may have set during December-January should be stripped from the trees. This fruit is valueless for export, and if allowed to mature, will affect the main crop setting of fruit.

DECIDUOUS FRUITS.

When sufficiently mature, plough under cover crops. This should be possible towards the end of the month.

Summer pruning should be completed early in the month; little or no advantage will be derived from trees treated when the new wood reaches maturity.

Do not allow fruit to become over-ripe, then expect remunerative prices for it. If it is harvested at the correct stage, then well graded and neatly packed, good prices may be expected for the surplus fruit sold.

This is a good month for budding deciduous fruit trees.

CROPS.

Cultivate, and keep on cultivating as weather permits, to destroy weeds. Continue to look out for stalk borer, and, if infection is discovered, deal with infested plants as advised in January notes. Watch witch weed and continue cultivating and hand pulling it. Plough under witch weed, smother and trap crops. Where practised, maize can be under-planted with sweet potato vines after the last cultivation for the following season's requirements. Potatoes and ground nuts will probably need to be ridged again. Catch crops of quick maturing beans, such as tepary bean, also buckwheat, can still be sown. Keep down all noxious weeds. This work can be undertaken on wet days. Make veld grass hay whenever a few days of fine weather permit. Early mowings provide the best hay. Seed beds of onions for early winter planting can be sown towards the end of the month. Keep potatoes in a cool shed, well ventilated. Pick over any potatoes in storage and remove bad ones. Continue to make as much farm manure as possible. Begin to ride manure and place in heaps handy to the lands to be manured.

DAIRYING.

This is normally the flush season as far as dairy produce is concerned; dairy cattle are usually in good condition and cows of average capacity should be able to subsist and maintain a full flow of milk on veld grazing alone. *Calves may be given a few hours' exercise on bright, sunny days;* young stock, however, should not be allowed to run and graze with the herd, and are best kept in a cool, airy pen opening on to a small shady paddock, where they can obtain a little exercise.

A good quality of sweet hay and water should always be available for young calves.

Cream deteriorates very rapidly under the conditions which obtain at this time of the year, so that every precaution should be taken to keep the cream as cool as possible pending despatch to the creamery. As there is a greater strain than usual on the separator during the flush months, frequent oiling is necessary, and care should be taken that the machine is mounted on a level foundation. The separator and all other dairy utensils must be cleaned immediately after use. First rinse the utensils with cool or lukewarm water, then wash thoroughly with boiling hot water, washing soda and a scrubbing brush; scald finally with boiling water.

The cheese in the storeroom is apt to develop mould during wet weather. If the cheese is well made and pressed and has a smooth rind, this mould is merely superficial and will not penetrate into the body of the cheese. *Rubbing the cheese with a cloth moistened with a weak solution* of formalin or permanganate of potash usually checks the development of mould. During these months care must be taken not to use over-acid milk for cheesemaking, and great care should also be taken of the starter. If this latter shows any signs of gasiness or develops any disagreeable flavour or odour it should be discarded and replaced by a fresh, clean starter. The cheese storeroom must be kept dark and flies excluded.

ENTOMOLOGICAL.

Maize.—The first brood of the stalk borer matures this month, and the young of the second brood may be found amongst the younger leaves. Weeds should be kept down.

Tobacco.—Stem borer, leaf miner and budworms are the chief pests likely to be troublesome. Plants in the field found infested with the first two insects should be heavily pruned or destroyed. The budworm caterpillars can usually be hand picked during the process of topping. (See "Rhodesia Agricultural Journal," December, 1927.)

Potato.—Ladybirds and tuber moth may call for attention. The latter, when very bad, sometimes causes considerable wilting of the crop besides

attacking tubers. The ladybirds may be destroyed by spraying with arsenate of lead 1 lb. to 16 gallons of water.

Cabbage Family.—All members of the family are liable to be attacked by the sawfly and webworm. The sawfly may be effectively controlled by dusting during a dry spell with Paris green and slaked lime (1 lb. Paris green and 20 lbs. slaked lime).

Melon Family.—The most important pest is the melon fly, which "stings" the fruit of all species of gourds. Destroy all badly "stung" fruit and spray remainder thoroughly with arsenate of lead (2 ozs. in 4 gallons of water) to which 2½ lbs. of cheap sugar has been added.

Deciduous Fruit.—Apples, pears and late peaches suffer chiefly from fruit moths, which puncture the fruit. No remedy available except covering the trees with netting.

Fig.—The fruit is liable to the attack of the fig weevil. All infested fruit and all wild fruit should be collected and destroyed. The borer in the stem may be killed by inserting a little carbon bisulphide into the burrow and sealing it up.

Poison Baiting.—Poison baiting against surface beetles, cutworms etc.: No really effective bait has yet been discovered for cutworms, but the following poisoned bait is recommended for surface beetles, etc.: Paris green 1 lb., 180 lbs. maize meal. Mix thoroughly in dry state and add water until the material is of the consistency of a dough. Roll into small balls and place under shade. Spread in the evening.

FLOWER GARDEN.

Sow carnations, phlox, pansy, verbena, gilias, larkspur, dianthus and pentstemon. The flower garden should be now looking its best, nearly all plants being in bloom. Old and dead flowers should be constantly removed, except when the seed is required. Seeding of the plants shortens their flowering period. All runners and climbers should have constant attention, and be tied up and trained, otherwise they will be damaged by the wind. Dahlias, chrysanthemums and carnations will require staking, as they become top heavy when in flower. Make the first sowing of winter-flowering sweet peas.

VEGETABLE GARDEN.

Sow now—Beans, beet, cabbage, cauliflower, lettuce, peas, onions, carrots, parsnips, turnips, endive, kohl rabi, rhubarb and all herbs.

FORESTRY.

Tree planting operations should be carried out on dull, showery days or late in the afternoons. Take care in setting out the plants, avoid bending the roots, and do not plant deeper than the plants were in the seed beds or trays. Steps should be taken to prepare seed beds for the slower growing species, i.e., pines, cypresses and callitris, and seed of these species should be sown for the following season's planting.

GENERAL.

This is a busy time for the farmer. Weeds will be very much in evidence and difficulty will be experienced in keeping them under. Stock will have fully recovered their condition, but ticks will be troublesome. The dipping tanks must be fully utilised now.

POULTRY.

Cockerels for future breeding should now have been selected, and those not good enough sold for killing. It pays far better to get rid of all of the latter, even if only at 1s. or 1s. 3d. per lb., than to keep them on, eating their heads off, in the hope of getting a better price. Those good enough for breeding, and they must be good, should be kept till about June; there is a demand for such up to this month. Any surplus at this

time should be eaten or sold for what they will fetch. Of those selected for breeding purposes, the owner should keep the best one or two for his own use, with another as a reserve. No poultry keeper should sell his best stock, no matter how high a price is offered for it.

By the end of this month the birds selected for breeding should be mated up. If it is possible, the birds selected for breeding should be given a run on free range for three weeks or so before being put into the breeding pen and fed sparingly; better fertility and better chicks will be the result. If it is possible to run the birds selected for breeding away from the others during the whole of the breeding season, all the better. Any hens that become broody should be kept broody by setting a few china eggs under them until such time as eggs from the breeders come in. Broody hens at *this time and for the next five months are valuable.*

During the rainy season the scratching litter must be kept dry; if it gets wet it is useless.

Duck hatching can be continued all the year round; the main points are that the young ducks must be kept out of the sun and sleep on dry grass. Nothing is more fatal to ducklings than sun, and dampness at night; and the latter applies, too, to the adults. Unless a dry shed, with a dry, soft layer of chaff or sand, etc., covering the floor of it, is available, it is not wise to hatch turkeys till after the wet season is finished, for it will be labour, food and eggs wasted. If the young turkeys get wet they are almost certain to die. This and the feeding on wet mashes instead of dry food, chopped onions and thick milk are the chief reasons for non-success in the breeding of turkeys.

STOCK.

Cattle.—The recommendations for December apply equally to this month. Be careful that the condition of the bulls is maintained, especially in the case of well-bred animals. A bull in poor condition cannot be expected to sire a large number of calves. As far as practicable cut veld hay during this month. Usually the optimum relation of yield and composition occurs now. During this month, in addition to maize, some protein concentrate such as peanut cake or cotton-cake will generally be necessary in the dairy cow mixture to keep up a good milk flow. Increase the grain ration to bullocks which are being fattened on grass and add some protein concentrate to their feed to make good the deficiency of this nutrient in the grazing.

Sheep.—Continue as recommended for December. If heavy rains are experienced, a daily ration of half a pound of maize per ewe will help to keep them in condition. Those who favour autumn lambs must put the ram again with the flock in February, and should take steps to supply a little extra feed to fit the ewes for mating. Start putting in green feed for ewes due to lamb in April or May.

TOBACCO.

The early tobacco should now be ready for curing. Care should be taken to select *only thoroughly ripe leaf* for filling the barns, so that the cured product will be uniform. Topping, priming and suckering should be given attention. Selected seed plants should be carefully watched. New land intended for tobacco next year should be ploughed this month, so that all organic matter turned under may be converted into humus before planting time next season.

WEATHER.

This is often the wettest month of the year, with marked differences of from 10 inches to 15 inches on the eastern mountain ranges, 7½ inches over Mashonaland, 4 inches to 6 inches in Matabeleland, and least, but still some, rains in the Limpopo Valley. The rains may be expected to decrease in intensity after the middle of the month if the season is normal.

SOUTHERN RHODESIA WEATHER BUREAU.

NOVEMBER, 1931.

Pressure.—The mean barometric pressure for the month was above normal in the south-west, but below normal in the north.

Pressure Movements.—The equatorial low developed on the 2nd of the month and extended over the Union and Southern Rhodesia up to the 9th and was associated with much rain. No southerly lows appeared during this period. Several weak southerly lows succeeded. The first on the 10th and 11th, the second on the 16th, 17th and 18th, the third on the 20th and 21st, the fourth on the 24th, 25th and 26th. The equatorial low appeared on the 27th and remained in the Cape up to the 29th; on the 30th it extended into Southern Rhodesia and the Transvaal.

Highs showed a characteristic tendency to appear on the south coast and extend along the east coast, anticyclonic isobars only appearing when the high was well in on the east coast.

Two highs appeared, one on the 3rd and one on the 6th, on the south coast; these remained off the coast. A third appeared on the south coast on the 11th and moved inland, covering South Africa up to the 18th. Further highs appeared on the south coast on the 19th and 22nd, and established themselves inland.

Temperature.—Mean temperatures for the month were everywhere well below normal, varying from 2° to 6° F.

Rain.—Scattered showers fell on the 1st, and were fairly general in Matabeleland on the 2nd, extending towards the north on the 3rd and 4th. Showers were fairly general from the 5th to the 13th, lightening on the 14th and 15th, and

were limited to the north-east from the 16th to the 18th. The 19th was fine. Odd showers were reported daily for the rest of the month, except on the 28th, which was fine.

The total amount of rain recorded in the zones was as follows:—

Zone.	November, 1931.	Average, November.
A	5.22	3.0
B	3.33	2.5
C	6.96	3.4
D	3.73	3.7
E	4.60	3.6
F	4.61	5.0

The above table shows that the rain was heaviest in A and C, and below normal in F. The total rainfall for the season is 5.9 inches, as compared with an average of 4.2 inches. Four Novembers are recorded with a higher rainfall, the latest being 1908.

NOVEMBER, 1931.

Station.	Pressure Millibars, 8.30 a.m.		Temperature in Stevenson Screen ° F.								Rel. Hum.	Dew Point	Cloud Amt.	Precipitation.			Altitude (Feet).
			Absolute.		Mean.												
	Mean.	Normal.	Max.	Min.	Max.	Min.	½ Max. ½ Min.	Normal.	Dry Bulb.	Wet Bulb.	%	F.	0-10	Ins.	Normal.	No. of Days.	
Bulawayo ...	868.8	867.8	89.5	53.5	78.2	59.3	68.8	72.6	67.9	61.2	68	57	4.4	4.21	3.2	9	4,436
Gwelo	862.7	...	88	56	77.6	59.4	68.5	73.6	68.5	61.7	68	58	6.6	5.15	3.7	12	4,632
Riverbank ...	...	...	92	57	81.8	61.1	71.5	76.5	70.8	62.8	64	58	..	7.41	2.2	13	4,100
Essexvale ...	...	...	95	55	80.8	60.7	70.8	75.5	68.6	63.4	75	60		5.78	2.0	12	3,828
Gwanda ...	910.4	...	94	52	78.9	62.0	70.5	...	70.8	62.9	64	58	5.2	3.07	2.2	7	3,235
Mazunga ...	...	047.6	...	...	...	...	...	78.2	...	...	...	...	...	...	2.1	...	1,970
Nuanetsi ...	...	...	102	58	87.0	63.5	75.3	..	73.4	69.2	81	67	...	3.00	2.9	5	1,630
Between Rivers	...	...	92.7	57.4	82.3	62.2	72.3	...	70.7	63.8	69	60	6.5	9.55	2.4	16	3,970
Enkeldoorn ...	...	...	89	52	76.5	58.6	67.6	72.0	68.0	61.5	69	58	6.5	8.34	3.4	15	4,720
Gatooma ...	...	...	94	57	83.1	61.4	72.3	77.0	71.6	64.3	67	60	6.4	7.62	2.9	16	3,850
Miami	...	...	91	58	80.1	62.8	71.5	...	70.5	64.1	70	61	5.7	6.19	2.3	9	4,090
Salisbury ...	854.9	855.1	87.2	56.1	77.8	59.9	68.9	71.9	68.1	61.2	68	58	6.5	6.54	3.3	14	4,865
Sinoia, Citrus ...	...	...	...	58	...	61.7	...	...	71.5	66.7	78	64	...	6.59	...	5	3,830
Sipolilo... ...	...	...	92	60	80.3	64.5	72.4	...	72.2	63.6	62	59	5.8	5.79	3.3	12	3,900
Juliasdale ...	...	...	83.7	47.7	72.1	54.3	63.2	64.6	66.1	59.6	68	55	...	3.86	3.6	12	6,070
Mtoko	...	...	91	56	81.1	61.1	71.1	...	71.4	63.7	66	60	5.4	1.02	3.3	6	4,210
Shamva ...	...	...	96	62	84.8	68.7	76.8	...	74.6	...	...	...	6.3	3.94	3.1	8	3,170
Angus Ranch ...	...	...	100	62	82.5	65.7	74.1	79.7	73.0	67.7	76	65	...	2.93	1.8	12	2,300
Craigendoran ...	...	...	97	59	82.7	62.5	72.6	...	74.3	65.8	64	61	...	5.21	3.3	12	3,430
New Year's Gift	...	...	95.2	58.9	80.4	61.9	71.2	...	70.2	65.1	76	62	...	3.29	3.0	11	2,700
Nyamusanga ...	...	...	88	51	77.0	55.4	66.2	...	68.1	60.4	64	55	...	6.54	...	13	5,080
Riverdene North	...	...	92	53	79.6	59.4	69.5	...	68.7	63.5	75	61	...	5.67	2.8	13	3,700
Stapleford ...	...	...	81	46	69.1	54.8	61.9	...	62.4	59.2	83	57	7.6	6.25	6.0	15	5,450
Umtali	893.1	893.0	91	56	77.0	61.1	69.1	72.6	68.6	63.4	75	62	6.5	3.99	3.7	15	3,677
Victoria ...	...	...	90	54	76.8	59.9	68.4	72.7	69.5	63.7	72	60	6.9	2.91	3.0	12	3,570
Melsetter ...	850.9	...	85	52	72.7	56.1	64.4	...	65.3	60.2	74	58	1.8	4.26	5.0	14	5,060
Mount Selinda	...	...	87	52	74.0	59.5	66.8	...	64.3	61.9	87	60	...	6.55	5.0	18	3,520

NOTES FROM THE "GAZETTE."

"Gazette" Date.	*Items.*
	CATTLE CLEANSING ACT, 1927.
4.12.31.	Government Notice No. 723, "Inspectors under the 'Cattle Cleansing Act, 1927,'" cancels all previous appointments of inspectors and appoints the Chief Veterinary Surgeon, district veterinary surgeons, assistant veterinary surgeons, cattle inspectors and European members of the Police Force who are at present or who may in future be appointed or attested as such to be inspectors for the purposes of the said Act.
	POUNDS AND TRESPASSES ORDINANCE.
11.12.31.	Government Notice No. 734 notifies that, in terms of section 5 of the Pounds and Trespasses Ordinance, a pound has been established on the Government Reserve, Filabusi, Insiza district, as from the 1st January, 1932.

HANDBOOK OF TOBACCO DISEASES.

Attention of readers is drawn to the fact that the Department of Agriculture has found it most inconvenient, with the present shortage of staff, to handle the local sales of this book. Arrangements have therefore been made with the Rhodesian Printing and Publishing Company for distribution by them throughout Southern Rhodesia. The book may be obtained from the Herald Store, Salisbury, price 4s., or, postage paid, 4s. 4d.

GWEBI PRODUCE PRICES.

Hull-less oats	40/- per bag of 150 lbs.
Large Black sunflower seed ...	14/- per bag of 100 lbs.
Dolichos beans	35/- per bag of 200 lbs.
Linseed	60/- per bag of 200 lbs.
Linseed (quantities under 100 lbs.)	4½d. per lb.
Sweet potato tubers (Calabash Leaf)	6/- per bag of 150 lbs.
Napier fodder roots	6/- per bag of 40 lbs.
Sweet potato cuttings (Calabash Leaf)	6/- per bag of 40 lbs.
Edible canna corms	10/- per bag of 150 lbs.
Pumpkin seed	1/1 per lb.

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

DEPARTMENTAL BULLETINS.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution at 3d. per copy. Application should be made to the Editor, Department of Agriculture, Salisbury, and remittances must accompany orders.

AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 374. Fibre Crops—Deccan Hemp (Hibiscus Cannabinus) and Sunn Hemp (Crotolaria Juncea), by J. A. T. Walters, B.A.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E, B.Sc., F.I.C.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 685. Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.

No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.

No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.

No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).

No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.

No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.

No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.

No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.

No. 732. Two Common Diseases of Potato Tubers in Rhodesia, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.

No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.

No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 757. Maize on the Sand Veld: Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.

No. 758. Instructions for Taking Soil Samples. Issued by the Division of Chemistry.

No. 759. Witch Weed (Striga Lutea): Methods of Control, by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 762. The Value of Rock Phosphate and "Bone and Superphosphate" as Fertilisers for Maize Production, by A. D. Husband, Chief Chemist.

No. 768. The Ground Nut (Arachis hypogaea), by S. D. Timson, M.C., Dip.Agric. (Wye).

No. 775. Agricultural Costings at the Gwebi Farm, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.

No. 776. Regulations Governing the Export of Maize and Maize Meal through the Port of Beira.

No. 777. Some Aspects of Cost of Production Studies in Agriculture, by Arthur G. Ruston, D.Sc., Department of Agriculture, Leeds University.

No. 781. Agricultural Costings at the Gwebi Farm—Maize and Green Manuring, by H. G. Mundy, Dip.Agric., F.L.S., Chief Agriculturist, and J. Hick, Accountant.

No. 783. Agricultural Costings at the Gwebi Farm—Fattening for Beef, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

No. 787. Agricultural Costings at the Gwebi Farm—Ground Nuts and Maize and Beans for Silage, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

No. 793. Agricultural Costings on the Gwebi Farm, by H. G. Mundy, Dip.Agric., Chief Agriculturist.

No. 797. Green Manuring: An Essential Practice in Rhodesian Farming, by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief Agriculturist.

No. 802. Witch Weed, by S. D. Timson, M.C., Inter.B.Sc. (Agric.) Lond., Dip.Agric. (Wye), Assistant Agriculturist.

No. 807. Studies on the Improvement of Natural Veld Pastures: No. 2, by A. D. Husband, F.I.C., and A. P. Taylor, M.A., B.Sc., Chemistry Branch, Department of Agriculture.

No. 813. A Preliminary Note on Clovers in Southern Rhodesia, by S. D. Timson, M.C., Dip.Agric. (Wye), Assistant Agriculturist.

No. 815. New Strains of Oats for Southern Rhodesia, by H. C. Arnold, Manager, Agricultural Experiment Station, Salisbury.

No. 816. Preliminary List of the more Common Grasses of Southern Rhodesia, by Sydney M. Stent, Botanist for Pasture Research.

No. 820. The Great Economic Problem in Agriculture—No. 1, by J. I McLoughlin, M.Sc. (Economics), Economic Adviser.
No. 822. Re-stacking of Maize rejected for Export on account (Excessive Moisture.
No. 823. The Law of Supply and Demand—No. 2, by J. R. McLoughlin M.Sc. (Economics), Economic Adviser.
No. 826. Some Poisonous Plants of Southern Rhodesia, by Sydney M Stent, Senior Botanist.
No. 831. Revised Notes on Cotton Growing in Southern Rhodesia, b G. S. Cameron.
No. 833. Subterreanean Clover on the Sand Veld as Feed for Poultry i the Winter, by S. D. Timson, M.C., Dip.Agric.(Wye).
No. 836. The Potato, by S. D. Timson, M.C., Dip.Agric.(Wye).
No. 837. Veld Grass Silage—A Feature in Rhodesian Pasture Managemen by H. G. Mundy, Dip.Agric. (Wye), F.L.S., Chief, Divisio of Plant Industry.
No. 838. Witch Weed—Progress Report and a Warning, by S. D. Timsoi M.C., Dip.Agric. (Wye), Assistant Agriculturist.
Botanical Specimens for Identification.
Accelerating the Sprouting of Potatoes.

REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gweb by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobb Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. *Reports on Crop Experiments*, Gwebi, 1915-16, Part I., by I A. Nobbs, Ph.D., B.Sc.
No. 246. Report on Crop Experiments, Gwebi Farm, Season 1915-1(Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobb Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., an J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experimer Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Statior Salisbury, by H. G. Mundy, F.L.S.
No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm 1921-22, *by H. G. Mundy, F.L.S.*
No. 440. Annual Report of Experiments, 1921-22, Experiment Statior Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experimer Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-2 by H. G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experimen *Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.*

No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station : Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.
No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.
No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.
No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.
No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.
No. 767. Gwelo Municipal Demonstration Stations. Annual Report for the Season 1928-29, by D. E. McLoughlin.
No. 773. Bulawayo Municipal Demonstration Station : Report for the Seasons 1927-28 and 1928-29, by D. E. McLoughlin, Assistant Agriculturist.
No. 789. Agricultural Experiment Station, Salisbury : Annual Report of Experiments, 1928-29, by H. C. Arnold, Manager.
No. 800. Bulawayo Municipal Experiment Station: Report for the Season 1929-30, by S. D. Timson, M.C., Dip.Agric. (Wye), Assistant Agriculturist.
No. 806. Gwebi Demonstration Farm, by the Chief Agriculturist.
No. 810. Gwelo Municipal Demonstration Station: Annual Report, 1929-30, by S. D. Timson, M.C., Inter.B.Sc. (Agric.) Lond., Dip.Agric. (Wye), Assistant Agriculturist.
No. 830. Salisbury Agricultural Experiment Station, Annual Report, 1929-30, by H. C. Arnold, Manager.

TOBACCO.

No. 605. Flue-curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-curing Tobacco Barn, by the Tobacco Advisers.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.
No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).
No. 661. Flue-curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.
No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.
No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.
No. 679. Tobacco Culture in Southern Rhodesia: The Harvesting and Curing of Virginia Tobacco, by D. D. Brown.
No. 689. The Lesser Tobacco Wireworms, by Rupert W. Jack, F.E.S.
No. 715. Turkish Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.

No. 718. Preliminary Experiments on the Control of White Mould of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

No. 728. *Suggested Crop Rotations for Tobacco Growers, by D. D. Brown, Chief Tobacco Expert.*

No. 734. Common Faults in Curing Virginia Bright Tobacco, by D. D. Brown, Tobacco and Cotton Expert.

No. 746. The Development of the Tobacco Industry in Southern Rhodesia. A Historical Survey, by D. D. Brown, Chief Tobacco Expert.

No. 748. Frog Eye Disease of Tobacco, by J. C. F. Hopkins, B.Sc. *(Lond.), A.I.C.T.A., Chief Botanist and Mycologist.*

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No. 765. Seasonal Notes on Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.

No. 771. Dark Fire-cured Tobacco: Field Operations, by D. D. Brown, Chief Tobacco Expert.

No. 774. Dark Fire-cured Tobacco: Harvesting and Curing, by D. D. Brown, Chief Tobacco Expert.

No. 779. Mycological Notes—Further Experiments on the Control of White Mould (Erysiphe Cichoracearum DC.) of Tobacco, 1927-28, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Plant Pathologist.

No. 784. Field Control of Frenching in Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Plant Pathologist.

No. 812. Selection of Tobacco Seed Plants, by H. F. Ellis, M.Sc., B.Sc. (Agr.), Tobacco Adviser.

No. 828. *Seed-Beds, by D. D. Brown, Chief Tobacco and Cotton Expert.*

No. 835. Tobacco Culture—Transplanting Operations, by D. D. Brown.

No. 839. Tobacco Experiment Station, Salisbury—Report of General Crop Experiments, by C. A. Kelsey Harvey, Manager.

No. 840. Curing Tobacco by the Leaf Method *v.* Curing on the Stalk, by W. Collingwood-Evans, B.Sc. (Agr.).

Handbook of Tobacco Diseases in Southern Rhodesia, by J. C. F. Hopkins, B.Sc., A.I.C.T.A. *Price 3/6 post free from Accountant,* Department of Agriculture, Salisbury.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.

No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.

No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.

No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by E. A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.

No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.

No. 286. *Statistics of Live Stock and Animal Produce for the Year 1917,* by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.

No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.

No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.

No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.

No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.

No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.

No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.

No. 527. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1923-24, by A. Borradaile Bell.

No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.

No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.

No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.

No. 626. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1925-26, by A. Borradaile Bell, Statistician.

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